SPECIFICATIONS

(FOR CONSTRUCTION CONTRACT)

SOLICITATION NO. DACW45-85-B-0001

EXTENSION OF MUNICIPAL WATER SUPPLY LINE, MATTHEWS ELECTROPLATING

SUPERFUND SITE
ROANOKE COUNTY, VA.

OCTOBER 1984

US Army Corps
of Engineers
Omaha District

Solicitation No. DACW45-85-B-0001

DEPARTMENT OF THE ARMY
OMAHA DISTRICT CORPS OF ENGINEERS
6014 U.S. POST OFFICE AND COURTHOUSE
OMAHA, NEBRASKA 68102

REPLY TO ATTENTION OF

Original
DATE: August 15

SUBJECT: INVITATION FOR BIDS - CONSTRUCTION CONTRACT

TO: All Prospective Bidders and Others Concerned

NAME AND LOCATION OF PROJECT:

Extension of Municipal Water Supply Line
Matthews Electroplating Superfund Site
Roanoke County, Virginia

BY (Issuing Office):

U.S. Army Engineer District, Omaha
6014 U.S. Post Office and Courthouse
215 North 17th Street
Omaha, Nebraska 68102

Sealed Bids (original and one copy) for the work described herein will be received until 2:00 p.m., local time at place of bid opening 84 Nov 15 in the office of the:

Superintendent of Public Facilities
County of Roanoke
3738 Brambleton Ave, SW, Rm 600
Roanoke, VA 240018

and at that time publicly opened.

Basis for Award.

IT IS INTENDED THAT AWARD WILL BE MADE TO ONE BIDDER FOR THE ENTIRE WORK.

AUTHORITY: The work provided for herein is authorized under the U.S. Environmental Protection Agency's Superfund Program.

Description of work: The work consists of furnishing all plant, labor, materials, and equipment and performing all work for installing 18,300 LF of water line, 31 building service connections, 10 fire hydrants, a 500,000-gallon aboveground water storage tank, and pumphouse with two booster pumps.

The above general outline does not limit the work to be less than all that required under the plans and specifications.

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BIDDING INFORMATION

1. EXPLANATION TO PROSPECTIVE BIDDERS (APRIL 1984). Any prospective bidder desiring an explanation or interpretation of the solicitation, drawings, specifications, etc., must request it in writing soon enough to allow a reply to reach all prospective bidders before the submission of their bids. Oral explanations or instructions given before the award of a contract will not be binding. Any information given a prospective bidder concerning a solicitation will be furnished promptly to all other prospective bidders as an amendment to the solicitation, if that information is necessary in submitting bids or if the lack of it would be prejudicial to other prospective bidders. (FAR 52.214-6.)

2. SOLICITATION DEFINITIONS - FORMAL ADVERTISING (APRIL 1984). "Advertised," for purposes of this solicitation, includes small business restricted advertising and other types of restricted advertising. "Offer" means "bid" in formal advertising. "Solicitation" means an invitation for bids in formal advertising. (FAR 52.214-1.)

3. SUBMISSION OF BIDS (APRIL 1984).

3.1 Bids and bid modifications shall be submitted in sealed envelopes or packages (1) addressed to the office specified in the solicitation and (2) showing the time specified for receipt, the solicitation number, and the name and address of the bidder.

3.2 Telegraphic bids will not be considered unless authorized by the solicitation; however, bids may be modified or withdrawn by written or telegraphic notice, if such notice is received by the time specified for receipt of bids. (FAR 52.214-3.)

4. PREPARATION OF BIDS - CONSTRUCTION (APRIL 1984).

4.1 Bids must be (1) submitted on the forms furnished by the Government or on copies of those forms, and (2) manually signed. The person signing a bid must initial each erasure or change appearing on any bid form.

4.2 The bid form may require bidders to submit bid prices for one or more items on various bases, including:

(1) lump sum bidding;
(2) alternate prices;
(3) units of construction; or
(4) any combination of subparagraphs (2) through (3) above.

4.3 If the solicitation requires bidding on all items, failure to do so will disqualify the bid. If bidding on all items is not required, bidders should insert the words "no bid" in the space provided for any item on which no price is submitted.

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BIDDING INFORMATION

4.4 Alternate bids will not be considered unless this solicitation authorizes their submission. (FAR 52.214-18.)

5. FALSE STATEMENTS IN BIDS (APRIL 1984). Bidders must provide full, accurate, and complete information as required by this solicitation and its attachments. The penalty for making false statements in bids is prescribed in 18 U.S.C. 1001. (FAR 52.214-4.)

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6. LATE SUBMISSIONS, MODIFICATIONS, AND WITHDRAWALS OF BIDS (APRIL 1984).

6.1 Any bid received at the office designated in the solicitation after the exact time specified for receipt will not be considered unless it is received before award is made and it --

(1) was sent by registered or certified mail not later than the fifth calendar day before the date specified for receipt of bids (e.g., a bid submitted in response to a solicitation requiring receipt of bids by the 20th of the month must have been mailed by the 15th); or

(2) was sent by mail (or was a telegraphic bid if authorized), and it is determined by the Government that the late receipt was due solely to mishandling by the Government after receipt at the Government installation.

6.2 Any modification or withdrawal of a bid is subject to the same conditions as in paragraph 6.1 above.

6.3 The only acceptable evidence to establish the date of mailing of a late bid, modification, or withdrawal sent either by registered or certified mail is the U.S. or Canadian Postal Service postmark on the wrapper or on the original receipt from the U.S. or Canadian Postal Service. If neither postmark shows a legible date, the bid, modification, or withdrawal shall be processed as if mailed late. "Postmark" means a printed, stamped, or otherwise placed impression (exclusive of a postage meter machine impression) that is readily identifiable without further action as having been supplied and affixed by employees of the U.S. or Canadian Postal Service on the date of mailing. Therefore, bidders should request the postal clerks to place a hand cancellation bull's-eye postmark on both the receipt and the envelope or wrapper.

6.4 The only acceptable evidence to establish the time of receipt at the Government installation is the time/date stamp of that installation on the bid wrapper or other documentary evidence of receipt maintained by the installation.

6.5 Notwithstanding paragraph 6.1 above, a late modification of an otherwise successful bid that makes its terms more favorable to the Government will be considered at any time it is received and may be accepted.

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BIDDING INFORMATION

6.6 A bid may be withdrawn in person by a bidder or its authorized representative if, before the exact time set for receipt of bids, the identity of the person requesting withdrawal is established and that person signs a receipt for the bid. (FAR 52.214-7.)

7. INFORMATION FOR MODIFYING BIDS. Bids which have been mailed to the designated bid receiving office may be modified or withdrawn by mail, telegram, or mailgram. Modifications to or withdrawals of previously submitted bids should be transmitted to the place of bid opening shown on page 15-1.

8. BID GUARANTEE (APRIL 1984).

8.1 Failure to furnish a bid guarantee in the proper form and amount, by the time set for opening of bids, may be cause for rejection of the bid.

8.2 The offeror (bidder) shall furnish a bid guarantee in the form of a firm commitment, such as a bid bond, postal money order, certified check, cashier's check, irrevocable letter of credit, or, under Treasury Department regulations, certain bonds or notes of the United States. The Contracting Officer will return bid guarantees, other than bid bonds, (1) to unsuccessful bidders as soon as practicable after the opening of bids, and (2) to the successful bidder upon execution of contractual documents and bonds (including any necessary coinsurance or reinsurance agreements), as required by the bid as accepted.

8.3 If the successful bidder, upon acceptance of its bid by the Government within the period specified for acceptance, fails to execute all contractual documents or give a bond(s) as required by the solicitation within the time specified, the Contracting Officer may terminate the contract for default.

8.4 Unless otherwise specified in the bid, the bidder will (1) allow 60 days for acceptance of its bid, and (2) give bond within 10 days after receipt of the forms by the bidder.

8.5 In the event the contract is terminated for default, the bidder is liable for any cost of acquiring the work that exceeds the amount of its bid, and the bid guarantee is available to offset the difference. (FAR 52.228-1.)

8.6 Each bidder shall submit with his bid a bid bond (Standard Form 24) or other security in the amount of twenty percent (20%) of the total bid price including any additives or three million dollars ($3,000,000) whichever is lesser. The bid bond penalty may be expressed in terms of a percentage of the total bid price or expressed in dollars and cents. (Bid bonds are not required for projects less than $25,000.)

BIDDING INFORMATION

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8.4 [illegible] in the bid, the bidder will [illegible] its bid, and (2) give bond within 10 days after receipt of the forms by the bidder.

8.5 [illegible] the contract is terminated for default, the [illegible] the work that exceeds the amount [illegible] bid, and the bid guarantee is available to offset the difference. [illegible]

8.6 [illegible] bidder shall submit with his bid a bid bond (Standard [illegible] in the amount of twenty percent (20%) of the total [illegible] Three Million Dollars ($3,000,000) [illegible] penalty may be expressed in terms of a [illegible] or expressed in dollars and cents. (Bid [illegible] less than $25,000.)

BIDDING INFORMATION

9. PERFORMANCE AND PAYMENT BONDS. (Not required for projects less than $25,000.) Within 10 days after the prescribed forms are presented to the bidder to whom award is made for signature, a written contract on the form prescribed by the specifications shall be executed and two bonds, each with good and sufficient surety or sureties acceptable to the Government, furnished; namely a performance bond (Standard Form 25) and a payment bond (Standard Form 25A). Any bonds furnished will be furnished by the Contractor to the Government prior to commencement of the contract performance. The cost of premiums for performance and payment bonds shall be included in the bid price. The penal sums of such bonds will be as follows:

9.1 PERFORMANCE BOND. The penal sum of the performance bond shall equal one hundred percent (100%) of the contract price.

9.2 PAYMENT BOND.

9.2.1 When the contract price is $1,000,000 or less, the penal sum will be fifty percent (50%) of the contract price.

9.2.2 When the contract price is in excess of $1,000,000 but not more than $5,000,000, the penal sum shall be forty percent (40%) of the contract price.

9.2.3 When the contract price is more than $5,000,000, the penal sum shall be $2,500,000.

10. CONTRACT AWARD - FORMAL ADVERTISING - CONSTRUCTION.

10.1 The Government will award a contract resulting from this solicitation to the responsible bidder whose bid, conforming to the solicitation, will be most advantageous to the Government, price and other factors considered.

10.2 The Government may reject any or all bids, and waive informalities or minor irregularities in bids received.

10.3 The Government may accept any item or combination of items, unless doing so is precluded by a restrictive limitation in the solicitation of the bid.

10.4 For the purposes of this solicitation, the word "item" shall be considered to mean "schedule."

11. NOTICE OF TOTAL SMALL BUSINESS SET-ASIDE (APRIL 1984).

11.1 DEFINITION. "Small business concern," as used in this clause, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the size standards in this solicitation.

BIDDING INFORMATION

11.2 GENERAL.

11.2.1 Offers are solicited only from small business concerns. Offers received from concerns that are not small business concerns shall be considered nonresponsive and will be rejected.

11.2.2 Any award resulting from this solicitation will be made to a small business concern.

11.3 AGREEMENT. A manufacturer or regular dealer submitting an offer in its own name agrees to furnish, in performing the contract, only end items manufactured or produced by small business concerns inside the United States, its territories and possessions, the Commonwealth of Puerto Rico, the Trust Territory of the Pacific Islands or the District of Columbia. However, this requirement does not apply in connection with construction or service contracts. (FAR 52.219-1.)

11.4 STANDARD INDUSTRIAL CLASSIFICATION (SIC). In accordance with Division C of the SIC Manual, the work in this solicitation is assigned classification code 1623.

12. ADDITIONAL DRAWINGS AND SPECIFICATIONS. Sets of drawings, reduced to half-size, and of specifications will be furnished upon receipt of payment of $4.00 per set. If individual plan sheets are requested, they will be furnished at a rate per sheet of $0.50 for full size sheets, but with a minimum charge of $1.00. The drawings need not be returned but in the event no award is made, the payment will be refunded upon request. Additional copies of the specifications alone will be furnished an applicant at the rate of $1.00 per copy. Payment will be made by check or money order payable to "Omaha District, Corps of Engineers" and delivered to the Commander, U.S. Army Engineer District, Corps of Engineers, 215 N. 17th Street, Omaha, Nebraska 68102, ATTN: Finance and Accounting Office.

13. AMENDMENT.

13.1 CHANGES PRIOR TO OPENING BIDS. The right is reserved, as the interest of the Government may require, to revise the specifications and/or drawings prior to the date set for opening bids. Such revisions will be announced by an amendment or amendments to this Invitation for Bids. Copies of each such amendment will be furnished to all prospective bidders. If the revisions and amendments are of a nature which requires material changes in quantities or prices to be bid, the date set for opening bids may be postponed as necessary, in the opinion of the Commander, to enable bidders to revise their bids. In such cases the amendment will include an announcement of the new date for opening bids.

13.2 ACKNOWLEDGEMENT OF AMENDMENTS TO INVITATIONS FOR BIDS (APRIL 1984). Bidders shall acknowledge receipt of any amendment to this solicitation (a) by signing and returning the amendment, (b) by identifying the

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amendment number and date in the space provided for this purpose on the form for submitting a bid, or (c) by letter or telegram. The Government must receive the acknowledgment by the time and at the place specified for receipt of bids. (FAR 52.214-3.)

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14. AVAILABILITY OF SPECIFICATIONS, STANDARDS, AND DESCRIPTIONS. Specifications, standards, and descriptions cited in this solicitation are available as indicated below:

14.1 UNCLASSIFIED FEDERAL, MILITARY AND OTHER SPECIFICATIONS AND STANDARDS (EXCLUDING COMMERCIAL), AND DATA ITEM DESCRIPTIONS. Submit request on DD Form 1425 (*Specifications and Standards Requisition*) to:

Commanding Officer
U.S. Naval Publications and Forms Center
5801 Tabor Avenue
Philadelphia, PA 19120

The Acquisition Management Systems and Data Requirements Control List, DOD Directive 5000.19L, Volume II may be ordered on the DD Form 1425. The Department of Defense Index of Specifications and Standards (DODISS) may be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When requesting a specification or standard, the request shall indicate the title, number, date, and any applicable amendment thereto by number and date. When requesting a data item description, the request shall cite the applicable data item number set forth in the solicitation. When DD Form 1425 is not available, the request may be submitted in letter form, giving the same information as listed above, and the solicitation or contract number involved. Such requests may also be made to the activity by telex No. 834295, Western Union No. 710-670-1685, or telephone (Area Code 215-697-3321) in case of urgency. (FAR 52.210-2.)

14.2 CORPS OF ENGINEERS SPECIFICATIONS. Corps of Engineers specifications of the CRD-C series may be obtained from U.S. Army Engineers Waterways Experiment Station, Attn: Publications Distribution, Information Services Branch, P.O. Box 631, Vicksburg, Mississippi.

14.3 COMMERCIAL (NON-GOVERNMENT) SPECIFICATIONS, STANDARDS, AND DESCRIPTIONS. These specifications, standards, and descriptions are not available from Government sources. They may be obtained from the publishers.

15. AVAILABLE PLANT. Each bidder shall, upon request of the Contracting Officer, furnish a list of the plant available to the bidder and proposed for use on the work.

16. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE. Whenever a modification or equitable adjustment of contract price is required, the Contractor's cost proposals for equipment ownership and operating expenses shall be determined in accordance with the requirements of paragraph:

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BIDDING INFORMATION

EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE, contained in the Special Clauses section of the specifications. A copy of EP 1110-1-8 "Construction Equipment Ownership and Operating Expense Schedule" is available for review in the office listed in paragraph: SITE INSPECTION herein.

17. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (APRIL 1984).

17.1 The offeror's attention is called to the Equal Opportunity clause and the Affirmative Action Compliance Requirements for Construction clause of this solicitation.

17.2 The goals for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Goals for Minority Participation for Each Trade	Goals for Female Participation for Each Trade
19.2	6.9

These goals are applicable to all the Contractor's construction work performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, the Contractor shall apply the goals established for the geographical area where the work is actually performed. Goals are published periodically in the Federal Register in notice form, and these notices may be obtained from any Office of Federal Contract Compliance Programs Office.

17.3 The Contractor's compliance with Executive Order 11246, as amended, and the regulations in 41 CFR 60-4 shall be based on (1) its implementation of the Equal Opportunity clause, (2) specific affirmative action obligations required by the clause entitled "Affirmative Action Compliance Requirements for Construction," and (3) its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade. The Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor, or from project to project, for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, Executive Order 11246, as amended, and the regulations in 41 CFR 60-4. Compliance with the goals will be measured against the total work hours performed.

17.4 The Contractor shall provide written notification to the Director, Office of Federal Contract Compliance Programs, within 10 working days following award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the --

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(1) name, address, and telephone number of the subcontractor;

(1) employer identification number of the subcontractor;

(2) estimated dollar amount of the subcontract;

(3) estimated starting and completion dates of the subcontract; and

(4) geographical area in which the subcontract is to be performed.

17.5 As used in this Notice, and in any contract resulting from this solicitation, the "covered area" is Roanoke SMSA 6800 of which Roanoke County is a part (FAR 52.222-23).

18. RATED OR AUTHORIZED CONTROLLED MATERIAL ORDERS (1974 APR). Contracts or purchase orders to be awarded as a result of this solicitation will be assigned a DO-C2 rating, in accordance with the provisions of DPS Regulation 1 and/or DMS Regulation 1. See CONTRACT CLAUSES Clause: "Priorities, Allocations, and Allotments" and SECTION: SPECIAL CLAUSES, Clause entitled CONTROLLED MATERIALS DATA. (FAR 52.212-7.)

19. NOTICE REGARDING BUY AMERICAN ACT (1970 SEP). The Buy American Act (41 U.S.C. 10a-10d) generally requires that only domestic construction material be used in the performance of this contract. Exception from the Buy American Act shall be permitted only in the case of nonavailability of domestic construction materials. A bid or proposal offering nondomestic construction material will not be accepted unless specifically approved by the Government. When a bidder or offeror proposes to furnish nondomestic construction material, his bid or proposal must set forth an itemization of the quantity, unit price, and intended use of each item of such nondomestic construction material. When offering nondomestic construction material pursuant to this paragraph, bids or proposals may also offer, at stated prices, any available comparable domestic construction material, so as to avoid the possibility that failure of a nondomestic construction material to be acceptable under this paragraph will cause rejection of the entire bid.

20. VIRGINIA SALES AND USE TAX. Specific exemption from the Virginia Sales and Use Taxes will be granted by the Virginia Tax authorities with respect to materials used by a prime Contractor or subcontractor and which are built into structures furnished under this contract. The Virginia Sales and Use Taxes shall be excluded from the bid prices. Exemption certificates are available to both Contractors and subcontractors provided application is made therefor to the Department of Taxation, Post Office Box 6-L, Richmond, Virginia 23282, for the necessary forms for claiming an exemption.

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BIDDING INFORMATION

21. SITE INSPECTION. Contractors interested in inspecting the site of the proposed work should do so. They may contact the Superfund Project Engineer's Office, Corps of Engineers, Omaha District, 6014 U.S. Post Office and Courthouse, Omaha, Nebraska 68102, at: (402) 221-4170.

22. BIDDER'S QUESTIONS AND COMMENTS. Questions and/or comments relative to these bidding documents should be submitted to the Commander, Omaha District, Corps of Engineers, 6014 U.S. Post Office and Courthouse, 215 North 17th Street, Omaha, NE 68102, ATTN: Engineering Division. Comments should reach this office no later than 20 calendar days prior to the date set for opening of bids, if feasible. In order that changes, if needed, may be added by amendment. Telephone calls concerning the purchasing of plans and specifications should be made between 8:45 a.m. and 3:45 p.m. to: (402) 221-4267 or 4268. Telephone calls on bidding matters and small business matters should be made to Mr. L. F. Karasek at: (402) 221-4256. Telephone calls on contents of drawings and specifications should be made to Chief, Superfund Section at: (402) 221-4170.

22.1 PLAN HOLDER'S LIST. A list of plan holders will be prepared and mailed approximately 2 weeks prior to the bid opening date to all who have been issued plans and specifications. This list will be furnished to all other interested parties upon request.

CAUTION TO BIDDERS - LATE BIDS

:See paragraph entitled "Late Submissions, Modifications, :
:and Withdrawal of Bids" which provides that late bids :
:and modifications or withdrawals thereof sent through :
:the mails will be considered ONLY IF SIMPLY MAILED BY :
:REGISTERED MAIL OR BY CERTIFIED MAIL FOR WHICH A POST- :
:MARKED RECEIPT HAS BEEN OBTAINED AS SPECIFIED IN SUCH :
:PROVISION. :

Attachments:
Contract Clauses Pages 1 thru 78
Wage Rate Decision No. 84-VA-392
Standard Form 1442 (Incl Certifications and Representations - Pages SF-3 thru SF-8)

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Issued by: Department of the Army, Corps of Engineers
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CONTRACT CLAUSES
CONSTRUCTION-INSIDE THE U.S.
Issued by: Department of the Army, Corps of Engineers
Edition of 1 Apr 84

1.1 DEFINITIONS (ALTERNATE I) (1984 APR) (DEVIATION)
FAR 52.202-1 (ECI 7-070 and 7-072)
(The following clause is applicable if the procurement instrument identification number is prefixed by the letters "DACW.")

(a) The term "head of the agency" or "Secretary" as used herein means the Secretary of the Army; and the term "his duly authorized representative" means the Chief of Engineers, Department of the Army, or an individual or board designated by him.

(b) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(c) The agency board of contract appeals having jurisdiction over all appeals from final decisions of the Contracting Officer under the Contract Disputes Act of 1978 is the Corps of Engineers Board of Contract Appeals, Office of the Chief of Engineers, Pulaski Building, 20 Massachusetts Avenue, N.W., Washington, D.C. 20314.#

1.2 DEFINITIONS (ALTERNATE I) (1984 APR) (DEVIATION)
FAR 52.202-1 (ECI 7-070)
(The following clause is applicable if the procurement instrument identification number is prefixed by the letters "DACA.")

(a) "Head of the agency" (also called "agency head") or "Secretary" means the Secretary (or Attorney General, Administrator, Governor, Chairperson, or other chief official, as appropriate) of the agency, including any deputy or assistant chief official of the agency, and, in the Department of Defense, the Under Secretary and any Assistant Secretary of the Departments of the Army, Navy, and Air Force and the Director and Deputy Director of Defense agencies; and the term "authorized representative" means any person, persons, or board (other than the Contracting Officer) authorized to act for the head of the agency or Secretary.

(b) "Contracting Officer" means a person with the authority to enter into, administer, and/or terminate contracts and make related determinations and findings. The term includes certain authorized representatives of the Contracting Officer acting within the limits of their authority as delegated by the Contracting Officer.

(c) The agency board of contract appeals having jurisdiction over all appeals from final decisions of the Contracting Officer under the Contract Disputes Act of 1978 is the Armed Services Board of Contract Appeals., 200 Stoval Street, Alexandria, Virginia 22332.#

2. OFFICIALS NOT TO BENEFIT (1984 APR) FAR 52.203-1

No member of or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this contract, or to any benefit arising from it. However, this clause does not apply to this contract to the extent that this contract is made with a corporation for the corporation's general benefit.#

3. GRATUITIES (1984 APR) FAR 52.203-3

(a) The right of the Contractor to proceed may be terminated by written notice if, after notice and hearing, the agency head or a designee determines that the Contractor, its agent, or another representative--

(1) Offered or gave a gratuity (e.g., an entertainment or gift) to an officer, official, or employee of the Government; and

(2) Intended, by the gratuity, to obtain a contract or favorable treatment under a contract.

(b) The facts supporting this determination may be reviewed by any court having lawful jurisdiction.

(c) If this contract is terminated under paragraph (a) above, the Government is entitled--

(1) To pursue the same remedies as in a breach of the contract; and

(2) In addition to any other damages provided by law, to exemplary damages of not less than three nor more than ten times the cost incurred by the Contractor in giving gratuities to the person concerned, as determined by the agency head or a designee. (This subparagraph (c)(2) is applicable only if this contract uses money appropriated to the Department of Defense.)

(d) The rights and remedies of the Government provided in this clause shall not be exclusive and are in addition to any other rights and remedies provided by law or under this contract.#

4. COVENANT AGAINST CONTINGENT FEES (1984 APR) FAR 52.203-5

(a) The Contractor warrants that no person or agency has been employed or retained to solicit or obtain this contract upon an agreement or understanding for a contingent fee, except a bona fide employee or agency. For breach or violation of this warranty, the Government shall have the right to annul this contract without liability or, in its discretion, to deduct from the contract price or consideration, or otherwise recover, the full amount of the contingent fee.

(b) "Bona fide agency," as used in this clause, means an established commercial or selling agency, maintained by a contractor for the purpose of securing business, that neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds itself out as being able to obtain any Government contract or contracts through improper influence.

"Bona fide employee," as used in this clause, means a person, employed by a contractor and subject to the contractor's supervision and control as to time, place, and manner of performance, who neither exerts nor proposes to exert improper influence to solicit or obtain Government contracts nor holds out as being able to obtain any Government contract or contracts through improper influence.

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"Contingent fee," as used in this clause, means any commission, percentage, brokerage, or other fee that is contingent upon the success that a person or concern has in securing a Government contract.

"Improper influence," as used in this clause, means any influence that induces or tends to induce a Government employee or officer to give consideration or to act regarding a Government contract on any basis other than the merits of the matter.#

5. PRIORITIES, ALLOCATIONS, AND ALLOTMENTS (1984 APR) FAR 52.212-8

(The following clause is applicable to rateable contracts.)

The Contractor shall follow the provisions of Defense Materials System Regulation 1 or Defense Priorities System Regulation 1 (see 32A CFR 621-662) and all other applicable regulations and orders of the Office of Industrial Resource Administration, Department of Commerce, in obtaining controlled materials and other products and materials needed to fill this order.#

6. VARIATION IN ESTIMATED QUANTITY (1984 APR) FAR 52.212-11

(The following clause is not applicable to bid items listed in the "Variations in Estimated Quantities--Subdivided Items" clause and also is not applicable to contracts for dredging work which contain the "Variations in Estimated Quantities--Dredging" clause.)

If the quantity of a unit-priced item in this contract is an estimated quantity and the actual quantity of the unit-priced item varies more than 15 percent above or below the estimated quantity, an equitable adjustment in the contract price shall be made upon demand of either party. The equitable adjustment shall be based upon any increase or decrease in costs due solely to the variation above 115 percent or below 85 percent of the estimated quantity. If the quantity variation is such as to cause an increase in the time necessary for completion, the Contractor may request, in writing, an extension of time, to be received by the Contracting Officer within 10 days from the beginning of the delay, or within such further period as may be granted by the Contracting Officer before the date of final settlement of the contract. Upon the receipt of a written request for an extension, the Contracting Officer shall ascertain the facts and make an adjustment for extending the completion date as, in the judgement of the Contracting Officer, is justified.#

7. SUSPENSION OF WORK (1984 APR) FAR 52.212-12

(a) The Contracting Officer may order the Contractor, in writing, to suspend, delay, or interrupt all or any part of the work of this contract for the period of time that the Contracting Officer determines appropriate for the convenience of the Government.

(b) If the performance of all or any part of the work is, for an unreasonable period of time, suspended, delayed, or interrupted (1) by an act of the Contracting Officer in the administration of this contract, or (2) by the Contracting Officer's failure to act within the time specified in this contract (or within a reasonable time if not specified), an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) necessarily caused by the unreasonable suspension, delay, or interruption, and

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the contract modified in writing accordingly. However, no adjustment shall be made under this clause for any suspension, delay, or interruption to the extent that performance would have been so suspended, delayed, or interrupted by any other cause including the fault or negligence of the Contractor, or for which an equitable adjustment is provided for or excluded under any other term or condition of this contract.

(c) A claim under this clause shall not be allowed (1) for any costs incurred more than 20 days before the Contractor shall have notified the Contracting Officer in writing of the act or failure to act involved (but this requirement shall not apply as to a claim resulting from a suspension order), and (2) unless the claim, in an amount stated, is asserted in writing as soon as practicable after the termination of the suspension, delay, or interruption, but not later than the date of final payment under the contract.#

8. AUDIT-FORMAL ADVERTISING (1984 APR) FAR 52.214-26

(The following clause is applicable if this contract is in excess of $100,000.)

(a) **Cost or Pricing Data.** If the Contractor has submitted cost or pricing data in connection with the pricing of any modification to this contract, unless the pricing was based on adequate price competition, established catalog or market prices of commercial items sold in substantial quantities to the general public, or prices set by law or regulation, the Contracting Officer or a representative who is an employee of the Government shall have the right to examine and audit all books, records, documents, and other data of the Contractor (including computations and projections) related to negotiating, pricing or performing the modification, in order to evaluate the accuracy, completeness, and currency of the cost or pricing data. In the case of pricing any modification, the Comptroller General of the United States or a representative who is an employee of the Government shall have the same rights.

(b) **Availability.** The Contractor shall make available at its office at all reasonable times the materials described in paragraph (a) above, for examination, audit, or reproduction, until 3 years after final payment under this contract, or for any other period specified in Subpart 4.7 of the Federal Acquisition Regulation (FAR). FAR Subpart 4.7, Contractor Records Retention, in effect on the date of this contract, is incorporated by reference in its entirety and made a part of this contract.

(1) If this contract is completely or partially terminated, the records relating to the work terminated shall be made available for 3 years after any resulting final termination settlement.

(2) Records pertaining to appeals under the Disputes clause or to litigation or the settlement of claims arising under or relating to the performance of this contract shall be made available until disposition of such appeals, litigation, or claims.

(c) The Contractor shall insert a clause containing all the provisions of this clause, including this paragraph (c), in all subcontracts over $10,000 under this contract, altering the clause only as necessary to identify properly the contracting parties and the contracting office under the Government prime contract.#

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9. **PRICE REDUCTION FOR DEFECTIVE COST OR PRICING DATA --MODIFICATIONS--FORMAL ADVERTISING (1984 APR) FAR 52.214-27**
(The following clause is applicable if this contract is in excess of $500,000.)

(a) This clause shall become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, of more than $500,000 except that this clause does not apply to any modification for which the price is--

(1) Based on adequate price competition;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

(b) If any price, including profit, negotiated in connection with any modification under this clause, was increased by any significant amount because (1) the Contractor or a subcontractor furnished cost or pricing data that were not complete, accurate, and current as certified in its Certificate of Current Cost or Pricing Data, (2) a subcontractor or prospective subcontractor furnished the Contractor cost or pricing data that were not complete, accurate, and current as certified in the Contractor's Certificate of Current Cost or Pricing Data, or (3) any of these parties furnished data of any description that were not accurate, the price shall be reduced accordingly and the contract shall be modified to reflect the reduction. This right to a price reduction is limited to that resulting from defects in data relating to modifications for which this clause becomes operative under paragraph (a) above.

(c) Any reduction in the contract price under paragraph (b) above due to defective data from a prospective subcontractor that was not subsequently awarded the subcontract shall be limited to the amount, plus applicable overhead and profit markup, by which (1) the actual subcontractor (2) the actual cost to the Contractor, if there was no subcontract, was less than the prospective subcontract cost estimate submitted by the Contractor; provided, that the actual subcontract price was not itself affected by defective cost or pricing data.#

10. **SUBCONTRACTOR COST OR PRICING DATA--MODIFICATION--FORMAL ADVERTISING (APR 1984) FAR 52.214-28**

(a) The requirements of paragraphs (b) and (c) of this clause shall (1) become operative only for any modification to this contract involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed $500,000 and (2) be limited to such modifications.

(b) Before awarding any subcontract expected to exceed $500,000 when entered into, or pricing any subcontract modification involving aggregate increases and/or decreases in costs, plus applicable profits, expected to exceed $500,000, the Contractor shall require the subcontractor to submit cost or pricing data (actually or by specific identification in writing), unless the price is--

(1) Based on adequate completion;

(2) Based on established catalog or market prices of commercial items sold in substantial quantities to the general public; or

(3) Set by law or regulation.

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(c) The Contractor shall require the subcontractor to certify in substantially the form prescribed in subsection 15.804-4 of the Federal Acquisition Regulation that, to the best of its knowledge and belief, the data submitted under paragraph (b) above were accurate, complete, and current as of the date of agreement on the negotiated price of the subcontract or subcontract modification.

(d) The Contractor shall insert the substance of this clause, including this paragraph (d), in each subcontract that exceeds $500,000 when entered into.#

11. EXAMINATION OF RECORDS BY COMPTROLLER GENERAL (1984 APR) FAR 52.215-1

(a) This clause applies if this contract exceeds $10,000 and was entered into by negotiation.

(b) The Comptroller General of the United States or a duly authorized representative from the General Accounting Office shall, until 3 years after final payment under this contract or for any shorter period specified in Federal Acquisition Regulation (FAR) Subpart 4.7, Contractor Records Retention, have access to and the right to examine any of the Contractor's directly pertinent books, documents, papers, or other records involving transactions related to this contract.

(c) The Contractor agrees to include in first-tier subcontracts under this contract a clause to the effect that the Comptroller General or a duly authorized representative from the General Accounting Office shall, until 3 years after final payment under the subcontract or for any shorter period specified in FAR Subpart 4.7, have access to and the right to examine any of the subcontractor's directly pertinent books, documents, papers, or other records involving transactions related to the subcontract. "Subcontract," as used in this clause, excludes (1) purchase orders not exceeding $10,000 and (2) subcontracts or purchase orders for public utility services at rates established to apply uniformly to the public, plus any applicable reasonable connection charge.

(d) The periods of access and examination in paragraphs (b) and (c) above for records relating to (1) appeals under the Disputes clause, (2) litigation or settlement of claims arising from the performance of this contract, or (3) costs and expenses of this contract to which the Comptroller General or a duly authorized representative from the General Accounting Office has taken exception shall continue until such appeals, litigation, claims, or exceptions are disposed of.#

12. UTILIZATION OF SMALL BUSINESS CONCERNS AND SMALL DISADVANTAGED BUSINESS CONCERNS (1984 APR) FAR 52.219-8

(a) It is the policy of the United States that small business concerns and small business concerns owned and controlled by socially and economically disadvantaged individuals shall have the maximum practicable opportunity to participate in performing contracts let by any Federal agency.

(b) The Contractor hereby agrees to carry out this policy in the awarding of subcontracts to the fullest extent consistent with efficient contract performance. The Contractor further agrees to cooperate in any studies or surveys as may be conducted by the United

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States Small Business Administration or the awarding agency of the United States as may be necessary to determine the extent of the Contractor's compliance with this clause.

(c) As used in this contract, the term "small business concern" shall mean a small business as defined pursuant to section 3 of the Small Business Act and relevant regulations promulgated pursuant thereto. The term "small business concern owned and controlled by socially and economically disadvantaged individuals" shall mean a small business concern--

(1) Which is at least 51 percent owned by one or more socially and economically disadvantaged individuals; or, in the case of any publicly owned business, at least 51 per centum of the stock of which is owned by one or more socially and economically disadvantaged individuals; and

(2) Whose management and daily business operations controlled by one or more of such individuals.

The Contractor shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans and other minorities, or any other individual found to be disadvantaged by the Administration pursuant to section 8(a) of the Small Business Act.

(d) Contractors acting in good faith may rely on written representations by their subcontractors regarding their status as either a small business concern or a small business concern owned and controlled by socially and economically disadvantaged individuals.#

13. SMALL BUSINESS AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING PLAN (ALTERNATE I) (1984 APR) FAR 52.219-9

(The following clause is applicable if this contract (1) offers subcontracting possibilities, (2) is expected to exceed $500,000, or $1,000,000 in the case of construction of any public facility, and (3) is required to include the clause in FAR 52.219-8.)

(a) This clause does not apply to small business concerns.

(b) "Commercial product," as used in this clause, means a product in regular production that is sold in substantial quantities to the general public and/or industry at established catalog or market prices. It also means a product which, in the opinion of the Contracting Officer, differs only insignificantly from the Contractor's commercial product.

"Subcontract," as used in this clause, means any agreement (other than one involving an employer-employee relationship) entered into by a Federal Government prime Contractor or subcontractor calling for supplies or services required for performance of the contract or subcontract.

(c) The apparent low bidder, upon request by the Contracting Officer, shall submit a subcontracting plan, where applicable, which addresses separately subcontracting with small business concerns and small disadvantaged business concerns, and which shall be included in and made part of the resultant contract. The subcontracting plan shall be submitted within the time specified by the Contracting Officer. Failure to submit the subcontracting plan shall make the bidder ineligible for the award of a contract.

(d) The offeror's subcontracting plan shall include the following:

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(1) Goals, expressed in terms of percentages of total planned subcontracting dollars, for the use of small business concerns and small disadvantaged business concerns as subcontractors. The offeror shall include all subcontracts that contribute to contract performance, and may include a proportionate share of products and services that are normally allocated as indirect costs.

(2) A statement of--

(i) Total dollars planned to be subcontracted;

(ii) Total dollars planned to be subcontracted to small business concerns; and

(iii) Total dollars planned to be subcontracted to small disadvantaged business concerns.

(3) A description of the principal types of supplies and services to be subcontracted, and an identification of the types planned for subcontracting to (i) small business concerns and (ii) small disadvantaged business concerns.

(4) A description of the method used to develop the subcontracting goals in (1) above.

(5) A description of the method used to identify potential sources for solicitation purposes (e.g., existing company source lists, the Procurement Automated Source System (PASS) of the Small Business Administration, the National Minority Purchasing Council Vendor Information Service, the Research and Information Division of the Minority Business Development Agency in the Department of Commerce, or small and small disadvantaged business concerns trade associations.)

(6) A statement as to whether or not the offeror included indirect costs in establishing subcontracting goals, and a description of the method used to determine the proportionate share of indirect costs to be incurred with (i) small business concerns and (ii) small disadvantaged business concerns.

(7) The name of the individual employed by the offeror who will administer the offeror's subcontracting program, and a description of the duties of the individual.

(8) A description of the efforts the offeror will make to assure that small business concerns and small disadvantaged business concerns have an equitable opportunity to compete for subcontracts.

(9) Assurances that the offeror will include the clause in this contract entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns" in all subcontracts that offer further subcontracting opportunities, and that the offeror will require all subcontractors (except small business concerns) who receive subcontracts in excess of $500,000 ($1,000,000 for construction of any public facility), to adopt a plan similar to the plan agreed to by the offeror.

(10) Assurances that the offeror will (i) cooperate in any studies or surveys as may be required, (ii) submit periodic reports in order to allow the Government to determine the extent of compliance by the offeror with the subcontracting plan, (iii) submit Standard Form (SF) 294, Subcontracting Report for Individual Contracts, and/or SF 295, Summary Subcontract Report, in accordance with the instructions on the forms, and (iv) ensure that its subcontractors agree to submit Standard Forms 294 and 295.

(11) A recitation of the types of records the offeror will maintain to demonstrate procedures that have been adopted to comply with the requirements and goals in the plan, including establishing source lists; and a description of its efforts to locate small and small disadvantaged business concerns and award subcontracts to them. The records shall include at least the following (on a plant-wide or company-wide basis, unless otherwise indicated):

(i) Source lists, guides, and other data that identify small and small disadvantaged business concerns.

(ii) Organizations contacted in an attempt to locate sources that are small or small disadvantaged business concerns.

(iii) Records on each subcontract solicitation resulting in an award of more than $100,000, indicating (A) whether small business concerns were solicited and if not, why not, (B) whether small disadvantaged business concerns were solicited and if not, why not, and (C) if applicable, the reason award was not made to a small business concern.

(iv) Records of any outreach efforts to contact (A) trade associations, (B) business development organizations, and (C) conferences and trade fairs to locate small and small disadvantaged business sources.

(v) Records of internal guidance and encouragement provided to buyers through (A) workshops, seminars, training, etc., and (B) monitoring performance to evaluate compliance with the program's requirements.

(vi) On a contract-by-contract basis, records to support award data submitted by the offeror to the Government, including the name, address, and business size of each subcontractor. Contractors having company or division-wide annual plans need not comply with this requirement.

(e) In order to effectively implement this plan to the extent consistent with efficient contract performance, the Contractor shall perform the following functions:

(1) Assist small business and small disadvantaged business concerns by arranging solicitations, time for the preparation of bids, quantities, specifications, and delivery schedules so as to facilitate the participation by such concerns. Where the Contractor's lists of potential small business and small disadvantaged subcontractors are excessively long, reasonable effort shall be made to give all such small business concerns an opportunity to compete over a period of time.

(2) Provide adequate and timely consideration of the potentialities of small business and small disadvantaged business concerns in all "make-or-buy" decisions.

(3) Counsel and discuss subcontracting opportunities with representatives of small and small disadvantaged business firms.

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(f) A master subcontracting plan on a plant or division-wide basis which contains all the elements required by (d) above, except goals, may be incorporated by reference as a part of the subcontracting plan required of the offeror by this clause; provided, (1) the master plan has been approved, (2) the offeror provides copies of the approved master plan and evidence of its approval to the Contracting Officer, and (3) goals and any deviations from the master plan deemed necessary by the Contracting Officer to satisfy the requirements of this contract are set forth in the individual subcontracting plan.

(g) (1) If a commercial product is offered, the subcontracting plan required by this clause may relate to the offeror's production generally, for both commercial and noncommercial products, rather than solely to the Government contract. In these cases, the offeror shall, with the concurrence of the Contracting Officer, submit one company-wide or division-wide annual plan.

(2) The annual plan shall be reviewed for approval by the agency awarding the offeror its first prime contract requiring a subcontracting plan during the fiscal year, or by an agency satisfactory to the Contracting Officer.

(3) The approved plan shall remain in effect during the offeror's fiscal year for all of the offeror's commercial products.

(h) Prior compliance of the offeror with other such subcontracting plans under previous contracts will be considered by the Contracting Officer in determining the responsibility of the offeror for award of the contract.

(i) The failure of the Contractor or subcontractor to comply in good faith with (1) the clause of this contract entitled "Utilization of Small Business Concerns and Small Disadvantaged Business Concerns," or (2) an approved plan required by this clause, shall be a material breach of the contract.#

14. UTILIZATION OF WOMEN-OWNED SMALL BUSINESSES (1984 APR)
FAR 52.219-13

(a) "Women-owned small businesses," as used in this clause, means businesses that are at least 51 percent owned by women who are United States citizens and who also control and operate the business.

"Control," as used in this clause, means exercising the power to make policy decisions.

"Operate," as used in this clause, means being actively involved in the day-to-day management of the business.

(b) It is the policy of the United States that women-owned small businesses shall have the maximum practicable opportunity to participate in performing contracts awarded by any Federal agency.

(c) The Contractor agrees to use its best efforts to give women-owned small businesses the maximum practicable opportunity to participate in the subcontracts it awards to the fullest extent consistent with the efficient performance of its contract.#

15. NOTICE TO THE GOVERNMENT OF LABOR DISPUTES (1984 APR)
FAR 52.222-1

(a) If the Contractor has knowledge that any actual or potential labor dispute is delaying or threatens to delay the timely performance

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of this contract, the Contractor shall immediately give notice, including all relevant information, to the Contracting Officer.

(b) The Contractor agrees to insert the substance of this clause, including this paragraph (b), in any subcontract to which a labor dispute may delay the timely performance of this contract; except that each subcontract shall provide that in the event its timely performance is delayed or threatened by delay by any actual or potential labor dispute, the subcontractor shall immediately notify the next higher tier subcontractor or the prime Contractor, as the case may be, of all relevant information concerning the dispute.#

16. CONVICT LABOR (1984 APR) FAR 52.222-3

The Contractor agrees not to employ any person undergoing sentence of imprisonment in performing this contract except as provided by 18 U.S.C. 4082(c)(2) and Executive Order 11755, December 29, 1973.#

17. DAVIS-BACON ACT (40 U.S.C. 276a to a-7)

(a) **Minimum wages.**

(1) All laborers and mechanics employed or working upon the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics. Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics, subject to the provisions of paragraph (a)(4) of this clause; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in the clause entitled "Apprentices and Trainees". Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein; provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(2) of this clause) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

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(2) (A) The Contracting Officer shall require that any class of laborers or mechanics which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Contracting Officer shall approve an additional classification and wage rate and fringe benefits therefor only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Contracting Officer agree on the classification and wage rate (including the amount designated for fringe benefits, where appropriate), a report of the action taken shall be sent by the Contracting Officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, D.C. 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt or will notify the Contracting Officer within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(C) In the event the Contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Contracting Officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the Contracting Officer shall refer the questions, including the views of all interested parties and the recommendation of the Contracting Officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the Contracting Officer or will notify the Contracting Officer within the 30-day period that additional time is necessary. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)

(D) The wage rate (including fringe benefits, where appropriate) determined pursuant to subparagraphs (a)(2)(B) and (a)(2)(C) of this clause shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(3) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the Contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

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(4) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of costs reasonably anticipated in providing bona fide fringe benefits under a plan or program; provided, that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program. (Approved by the Office of Management and Budget under OMB control number 1215-0140.)#

18. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT--OVERTIME COMPENSATION (40 U.S.C. 327-333)

This contract is subject to the Contract Work Hours and Safety Standards Act and to the applicable rules, regulations, and interpretations of the Secretary of Labor.

(a) **Overtime requirements.** No Contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of eight hours in any calendar day or in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of eight hours in any calendar day or in excess of forty hours in such workweek, whichever is greater.

(b) **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the provisions set forth in paragraph (a) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such Contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory) for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the provisions set forth in paragraph (a) of this clause, in the sum of $10 for each calendar day for which such individual was required or permitted to work in excess of eight hours or in excess of the standard workweek of forty hours without payment of the overtime wages required by the provisions set forth in paragraph (a) of this clause.

(c) **Withholding for unpaid wages and liquidated damages.** The Contracting Officer shall upon his or her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the Contractor or subcontractor under any such contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same Prime Contractor, such sums as may be determined to be necessary to satisfy any liabilities of such Contractor or subcontractor for unpaid wages and liquidated damages as provided in the provisions set forth in paragraph (b) of this clause.

(d) **Subcontracts.** The Contractor or subcontractor shall insert in any subcontracts the provisions set forth in paragraphs (a) through (d) of this clause and also a clause requiring the subcontractors to include these provisions in any lower tier subcontracts. The Prime Contractor shall be responsible for compliance by any subcontractor or lower tier subcontract with the provisions set forth in paragraphs (a) through (d) of this clause.#

19. APPRENTICES AND TRAINEES

(a) **Apprentices.** Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Bureau of Apprenticeship and Training, or with a State Apprenticeship Agency recognized by the Bureau, or if a person is employed in his or her first 90 days or probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Bureau of Apprenticeship and Training or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the Contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, frivolous shall be paid in accordance with that determination. In the event the Bureau of Apprenticeship and Training, or a State Apprenticeship Agency recognized by the Bureau, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(b) **Trainees.** Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced

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by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(c) **Equal employment opportunity.** The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.#

20. PAYROLLS AND BASIC RECORDS

(a) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work (or under the United States Housing Act of 1937, or under the Housing Act of 1949, in the construction or development of the project). Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under paragraph (a)(4) of the clause entitled "Davis-Bacon Act" that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing

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apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs. (Approved by the Office of Management and Budget under OMB control numbers 1215-0140 and 1215-0017.)

(b) (1) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Contracting Officer if the agency is a party to the contract, but if the agency is not such a party, the contractor will submit the payrolls to the applicant, sponsor, or owner, as the case may be, for transmission to the Contracting Officer. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under paragraph (a) of this clause. This information may be submitted in any form desired. Optional Form WH-347 is available for this purpose and may be purchased from the Superintendent of Documents (Federal Stock Number 029-005-00014-1), U.S. Government Printing Office, Washington, D.C. 20402. The Prime Contractor is responsible for the submission of copies of payrolls by all subcontractors. (Approved by the Office of Management and Budget under OMB control number 1215-0149.)

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance", signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be maintained under paragraph (a) of this clause and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR Part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification as set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by subparagraph (b)(2) of this clause.

(4) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

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(c) The Contractor or subcontractor shall make the records required under paragraph (a) of this clause available for inspection, copying, or transcription by authorized representatives of the Contracting Officer or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.#

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21. COMPLIANCE WITH COPELAND ACT REQUIREMENTS

The Contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.#

22. WITHHOLDING OF FUNDS

The Contracting Officer shall upon his or her own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same Prime Contractor, or any other Federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same Prime Contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages ,required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work (or under the United States Housing Act of 1937 or under the Housing Act of 1949 in the construction or development of the project), all or part of the wages required by the contract, the Contracting Officer may, after written notice to the Contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.#

23. SUBCONTRACTS

The Contractor or subcontractor shall insert in any subcontracts the clauses entitled "Davis-Bacon Act","Contract Work Hours and Safety Standards Act--Overtime Compensation", "Apprentices and Trainees", "Payrolls and Basic Records", "Compliance with Copeland Act Requirements", "Withholding", "Subcontracts", "Contract Termination-Debarment", "Disputes Concerning Labor Standards", "Compliance with Davis-Bacon and Related Act Requirements", and "Certification or Eligibility", and such other clauses as the Contracting Officer may, by appropriate instructions, require; and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The Prime Contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses cited above.#

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24. CONTRACT TERMINATION; DEBARMENT

A breach of the contract clauses entitled "Davis-Bacon Act", "Contract--Work Hours and Safety Standards Act--Overtime Compensation", "Apprentices and Trainees", "Payrolls and Basic Records", "Compliance with Copeland Act Requirements", "Withholding," "Subcontractors", "Compliance with Davis-Bacon and Related Act Requirements", and "Certification of Eligibility", may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.#

25. *DISPUTES CONCERNING LABOR STANDARDS*

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general Disputes Clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.#

26. COMPLIANCE WITH DAVIS-BACON AND RELATED ACT REQUIREMENTS

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.#

27. CERTIFICATION OF ELIGIBILITY

(a) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(b) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(c) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.#

28. EQUAL OPPORTUNITY (1984 APR) FAR 52.222-26

(a) If, during any 12-month period (including the 12 months preceding the award of this contract), the Contractor has been or is awarded nonexempt Federal contracts and/or subcontracts that have an aggregate value in excess of $10,000, the Contractor shall comply with subparagraphs (b)(1) through (11) below. Upon request, the Contractor shall provide information necessary to determine the applicability of this clause.

(b) During performing this contract, the Contractor agrees as follows:

(1) The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin.

(2) The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, color, religion, sex, or national origin. This shall include, but not be limited to, (i) employment, (ii) upgrading, (iii) demotion, (iv) transfer, (v) recruitment or recruitment advertising, (vi) layoff or termination,

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(vii) rates of pay or other forms of compensation, and (viii) selection for training, including apprenticeship.

(3) The Contractor shall post in conspicuous places available to employees and applicants for employment the notices to be provided by the Contracting Officer that explain this clause.

(4) The Contractor shall, in all solicitations or advertisement for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.

(5) The Contractor shall send, to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, the notice to be provided by the Contracting Officer advising the labor union or workers' representative of the Contractor's commitments under this clause, and post copies of the notice in conspicuous places available to employees and applicants for employment.

(6) The Contractor shall comply with Executive Order 11246, as amended, and the rules, regulations, and orders of the Secretary of Labor.

(7) The Contractor shall furnish to the contracting agency all information required by Executive Order 11246, as amended, and by the rules, regulations, and orders of the Secretary of Labor, Standard Form 100 (EEO-1), or any successor form, is the prescribed form to be filed within 30 days following the award, unless filed within 12 months preceding the date of award.

(8) The Contractor shall permit access to its books, records, and accounts by the contracting agency or the Office of Federal Contract Compliance Programs (OFCCP) for the purposes of investigation to ascertain the Contractor's compliance with the applicable rules, regulations, and orders.

(9) If the OFCCP determines that the Contractor is not in compliance with this clause or any rule, regulation, or order of the Secretary of Labor, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts, under the procedures authorized in Executive Order 11246, as amended. In addition, sanctions may be imposed and remedies invoked against the Contractor as provided in Executive Order 11246, as amended, the rules, regulations, and orders of the Secretary of Labor, or as otherwise provided by law.

(10) The Contractor shall include the terms and conditions of subparagraph (b)(1) through (11) of this clause in every subcontract or purchase order that is not exempted by the rules, regulations, or orders of the Secretary of Labor issued under Executive Order 11246, as amended, so that these terms and conditions will be binding upon each subcontractor or vendor.

(11) The Contractor shall take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing these terms and conditions, including sanctions for noncompliance; provided, that if the Contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of any direction, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

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(c) Notwithstanding any other clause in this contract, disputes relative to this clause will be governed by the procedures in 41 CFR 60-1.1.#

29. AFFIRMATIVE ACTION COMPLIANCE REQUIREMENTS FOR CONSTRUCTION (1984 APR) FAR 52.222-27

(a) Definitions. "Covered area," as used in this clause, means the geographical area described in the solicitation for this contract.

"Director," as used in this clause, means Director, Office of Federal Contract Compliance Programs (OFCCP), United States Department of Labor, or any person to whom the Director delegates authority.

"Employer identification number," as used in this clause, means the Federal Social Security number used on the employer's quarterly federal tax return, U.S. Treasury Department Form 941.

"Minority," as used in this clause, means--

(1) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(3) Black (all persons having origins in any of the black African racial groups not of Hispanic origin);

(4) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);

(b) If the Contractor, or a subcontractor at any tier, subcontracts a portion of the work involving any construction trade, each such subcontract in excess of $10,000 shall include this clause and the Notice containing the goals for minority and female participation stated in the solicitation for this contract.

(c) If the Contractor is participating in a Hometown Plan (41 CFR 60-4) approved by the U.S. Department of Labor in a covered area, either individually or through an association, its affirmative action obligations on all work in the plan area (including goals) shall comply with the plan for those trades that have unions participating in the plan. Contractors must be able to demonstrate participation in, and compliance with, the provisions of the plan. Each Contractor or subcontractor participating in an approved plan is also required to comply with its obligations under the Equal Opportunity clause, and to make a good faith effort to achieve each goal under the plan in each trade in which it has employees. The overall good-faith performance by other Contractors or subcontractors toward a goal in an approved plan does not excuse any Contractor's or subcontractor's failure to make good-faith efforts to achieve the plan's goals.

(d) The Contractor shall implement the affirmative action procedures in subparagraphs (g)(1) through (16) of this clause. The goals stated in the solicitation for this contract are expressed as percentages of the total hours of employment and training of minority and female utilization that the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for the geographical area where that work is

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actually performed. The Contractor is expected to make substantially uniform progress toward its goals in each craft.

(e) Neither the terms and conditions of any collective bargaining agreement, nor the failure by a union with which the Contractor has a collective bargaining agreement, to refer minorities or women shall excuse the Contractor's obligations under this clause, Executive Order 11246, as amended, or the regulations thereunder.

(f) In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(g) The Contractor shall take affirmative action to ensure equal employment opportunity. The evaluation of the Contractor's compliance with this clause shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully and implement affirmative action steps at least as extensive as the following:

(1) Ensure a working environment free of harassment, intimidation, and coercion at all sites and in all facilities where the Contractor's employees are assigned to work. The Contractor, if possible, will assign two or more women to each construction project. The Contractor shall ensure that foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at these sites or facilities.

(2) Establish and maintain a current list of sources for minority and female recruitment. Provide written notification to minority and female recruitment sources and community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

(3) Establish and maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant, referrals of minorities or females from unions, recruitment sources, or community organizations, and the action taken with respect to each individual. If an individual was sent to the union hiring hall for referral and not referred back to the Contractor by the union or, if referred back, not employed by the Contractor, this shall be documented in the file, along with whatever additional actions the Contractor may have taken.

(4) Immediately notify the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred back to the Contractor a minority or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

(5) Develop on-the-job training opportunities and/or participate in training programs for the area that expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs,

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especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under subparagraph (g)(2) above.

(6) Disseminate the Contractor's equal employee policy by--

(i) Providing notice of the policy to unions and to training, recruitment and outreach programs, and requesting their cooperation in assisting the Contractor in meeting its contract obligations;

(ii) Including the policy in any policy manual and in collective bargaining agreements;

(iii) Publicizing the policy in the company newspaper, annual report, etc.;

(iv) Reviewing the policy with all management personnel and with all minority and female employees at least once a year; and

(v) Posting the policy on bulletin boards accessible to employees at each location where construction work is performed.

(7) Review, at least annually, the Contractor's equal employment policy and affirmative action obligations with all employees having responsibility for hiring, assignment, layoff, termination, or other employment decisions. Conduct review of this policy with all onsite supervisory personnel before initiating construction work at a job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

(8) Disseminate the Contractor's equal employment policy externally by including it in any advertising in the news media, specifically including minority and female news media. Provide written notification to, and discuss this policy with, other Contractors and subcontractors with which the Contractor does or anticipates doing business.

(9) Direct recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students, and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than 1 month before the date for acceptance of applications for apprenticeship or training by any recruitment source, send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

(10) Encourage present minority and female employees to recruit minority persons and women. Where reasonable, provide after-school, summer, and vacation employment to minority and female youth both on the site and in other areas of the Contractor's work-force.

(11) Validate all tests and other selection requirements where required under 41 CFR 60-3.

(12) Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities. Encourage these employees to seek or to prepare for, through appropriate training, etc., opportunities for promotion.

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(13) Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the Contractor's obligations under this contract are being carried out.

(14) Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

(15) Maintain a record of solicitations for subcontracts for minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

(16) Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's equal employment policy and affirmative action obligations.

(h) The Contractor is encouraged to participate in voluntary associations that may assist in fulfilling one or more of the affirmative action obligations contained in subparagraphs (g)(1) through (16). The efforts of a contractor association, joint contractor-union, contractor-community, or similar group of which the contractor is a member and participant may be asserted as fulfilling one or more of its obligations under subparagraphs (g)(1) through (16), provided the Contractor--

(1) Actively participates in the group;

(2) Makes every effort to ensure that the group has a positive impact on the employment of minorities and women in the industry;

(3) Ensures that concrete benefits of the program are reflected in the Contractor's minority and female workforce participation;

(4) Makes a good-faith effort to meet its individual goals and timetables; and

(5) Can provide access to documentation that demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply is the Contractor's, and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(i) A single goal for minorities and a separate single goal for women shall be established. The Contractor is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and nonminority. Consequently, the Contractor may be in violation of Executive Order 11246, as amended, if a particular group is employed in a substantially disparate manner.

(j) The Contractor shall not use goals or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(k) The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts under Executive Order 11246, as amended.

(l) The Contractor shall carry out such sanctions and penalties for violation of this clause and of the Equal Opportunity clause, including suspension, termination, and cancellation of existing subcontracts, as may be imposed or ordered under Executive Order

11246, as amended, and its implementing regulations, by the OFCCP. Any failure to carry out these sanctions and penalties as ordered shall be a violation of this clause and Executive Order 11246, as amended.

(m) The Contractor in fulfilling its obligations under this clause shall implement affirmative action procedures at least as extensive as those prescribed in paragraph (g) above, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of Executive Order 11246, as amended, the implementing regulations, or this clause, the Director shall take action as prescribed in 41 CFR 60-4.8.

(n) The Contractor shall designate a responsible official to--

(1) Monitor all employment-related activity to ensure that the Contractor's equal employment policy is being carried out;

(2) Submit reports as may be required by the Government; and

(3) Keep records that shall at least include for each employee the name, address, telephone number, construction trade, union affiliation (if any), employee identification number, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, separate records are not required to be maintained.

(o) Nothing contained herein shall be construed as a limitation upon the application of other laws that establish different standards of compliance or upon the requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).#

30. AFFIRMATIVE ACTION FOR SPECIAL DISABLED AND VIETNAM ERA VETERANS (1984 APR) FAR 52.222-35

This clause is applicable pursuant to 41 C.F.R. 60-250, if this contract is for $10,000 or more.)

(a) Definitions. "Appropriate office of the State employment service system," as used in this clause, means the local office of the Federal-State national system of public employment offices assigned to serve the area where the employment opening is to be filled, including the District of Columbia, Guam, Puerto Rico, Virgin Islands, American Samoa, and the Trust Territory of the Pacific Islands.

"Openings that the Contractor proposes to fill from within its own organization," as used in this clause, means employment openings for which no one outside the Contractor's organization (including any affiliates, subsidiaries, and the parent companies) will be considered and includes any openings that the Contractor proposes to fill from regularly established "recall" lists.

"Openings that the Contractor proposes to fill under a customary and traditional employer-union hiring arrangement," as used in this clause, means employment openings that the Contractor proposes to fill from union halls, under their customary and traditional employer-union hiring relationship.

"Suitable employment openings," as used in this clause--

(1) Includes, but is not limited to, openings that occur in jobs categorized as--

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(i) Production and nonproduction;
(ii) Plant and office;
(iii) Laborers and mechanics;
(iv) Supervisory and nonsupervisory;
(v) Technical; and
(vi) Executive, administrative, and professional positions compensated on a salary basis of less than $25,000 a year; and

(2) Includes full-time employment, temporary employment of over 3 days, and part-time employment, but not openings that the Contractor proposes to fill from within its own organization or under a customary and traditional employer-union hiring arrangement, nor openings in an educational institution that are restricted to students of that institution.

(b) **General.**

(1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against the individual because the individual is a special disabled or Vietnam Era veteran. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified special disabled and Vietnam Era veterans without discrimination based upon their disability or veterans' status in all employment practices such as--

(i) Employment;
(ii) Upgrading;
(iii) Demotion or transfer;
(iv) Recruitment;
(v) Advertising;
(vi) Layoff or termination;
(vii) Rates of pay or other forms of compensation; and
(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Vietnam Era Veterans' Readjustment Assistance Act of 1972 (the Act), as amended.

(c) **Listing openings.**

(1) The Contractor agrees to list all suitable employment openings existing at contract award or occurring during contract performance, at an appropriate office of the State employment service system in the locality where the opening occurs. These openings include those occurring at any Contractor facility, including one not connected with performing this contract. An independent corporate affiliate is exempt from this requirement.

(2) State and local government agencies holding Federal contracts of $10,000 or more shall also list all their suitable openings with the appropriate office of the State employment service.

(3) The listing of suitable employment openings with the State employment service system is required at least concurrently with using any other recruitment source or effort and involves the obligations of placing a bona fide job order, including accepting referrals of veterans and nonveterans. This listing does not require hiring any particular job applicant or hiring from any particular

group of job applicants and is not intended to relieve the Contractor from any requirements of Executive orders or regulations concerning nondiscrimination in employment.

(4) Whenever the Contractor becomes contractually bound to the listing terms of this clause, it shall advise the State employment service system, in each state where it has establishments, of the name and location of each hiring location in the State. As long as the Contractor is contractually bound to these terms and has so advised the State system, it need not advise the State system of subsequent contracts. The Contractor may advise the State system when it is no longer bound by this contract clause.

(5) Under the most compelling circumstances, an employment opening may not be suitable for listing, including situations when

(i) the Government's needs cannot reasonably be supplied,

(ii) listing would be contrary to national security, or

(iii) the requirement of listing would not be in the Government's interest.

(d) **Applicability.**

(1) This clause does not apply to the listing of employment openings which occur and are filled outside the 50 states, the District of Columbia, Puerto Rico, Guam, Virgin Islands, American Samoa, and the Trust Territory of the Pacific Islands.

(2) The terms of paragraph (c) above of this clause do not apply to openings that the Contractor proposes to fill from within its own organization or under a customary and traditional employer-union hiring arrangement. This exclusion does not apply to a particular opening once an employer decides to consider applicants outside of its own organization or employer-union arrangement for that opening.

(e) **Postings.**

(1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified special disabled veterans and veterans of the Vietnam era, and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor (Director), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of the Act, and is committed to take affirmative action to employ, and advance in employment, qualified special disabled and Vietnam Era veterans.

(f) **Noncompliance.** If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations, and relevant orders of the Secretary issued pursuant to the Act.

(g) **Subcontracts.** The Contractor shall include the terms of this clause in every subcontract or purchase order of $10,000 or more unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Director to enforce the terms, including action for noncompliance.

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31. **AFFIRMATIVE ACTION FOR HANDICAPPED WORKERS (1984 APR) FAR 52.222-36**

(Contracts and subcontracts are exempt from the requirements of the following clause with regard to work performed outside the United States by employees who were not recruited within the United States).

(a) **General.**

(1) Regarding any position for which the employee or applicant for employment is qualified, the Contractor shall not discriminate against any employee or applicant because of physical or mental handicap. The Contractor agrees to take affirmative action to employ, advance in employment, and otherwise treat qualified handicapped individuals without discrimination based upon their physical or mental handicap in all employment practices such as--

(i) Employment;
(ii) Upgrading;
(iii) Demotion or transfer;
(iv) Recruitment;
(v) Advertising;
(vi) Layoff or termination;
(vii) Rates of pay or other forms of compensation; and
(viii) Selection for training, including apprenticeship.

(2) The Contractor agrees to comply with the rules, regulations, and relevant orders of the Secretary of Labor (Secretary) issued under the Rehabilitation Act of 1973 (29 U.S.C. 793) (the Act), as amended.

(b) **Postings.**

(1) The Contractor agrees to post employment notices stating (i) the Contractor's obligation under the law to take affirmative action to employ and advance in employment qualified handicapped individuals and (ii) the rights of applicants and employees.

(2) These notices shall be posted in conspicuous places that are available to employees and applicants for employment. They shall be in a form prescribed by the Director, Office of Federal Contract Compliance Programs, Department of Labor (Director), and provided by or through the Contracting Officer.

(3) The Contractor shall notify each labor union or representative of workers with which it has a collective bargaining agreement or other contract understanding, that the Contractor is bound by the terms of Section 503 of the Act and is committed to take affirmative action to employ, and advance in employment, qualified physically and mentally handicapped individuals.

(c) **Noncompliance.** If the Contractor does not comply with the requirements of this clause, appropriate actions may be taken under the rules, regulations and relevant orders of the Secretary issued pursuant to the Act.

(d) **Subcontracts.** The Contractor shall include the terms of this clause in every subcontract or purchase order in excess of $2,500 unless exempted by rules, regulations, or orders of the Secretary. The Contractor shall act as specified by the Director to enforce the terms, including action for noncompliance.#

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32. CLEAN AIR AND WATER (1984 APR) FAR 52.223-2

(a) "Air Act," as used in this clause, means the Clean Air Act (42 U.S.C. 7401 et seq.).

"Clean air standards," as used in this clause, means--

(1) Any enforceable rules, regulations, guidelines, standards, limitations, orders, controls, prohibitions, work practices, or other requirements contained in, issued under, or otherwise adopted under the Air Act or Executive Order 11738;

(2) An applicable implementation plan as described in section 110(d) of the Air Act (42 U.S.C. 7410(d));

(3) An approved implementation procedure or plan under section 111(c) or section 111(d) of the Air Act (42 U.S.C. 7411(c) or (d)); or

(4) An approved implementation procedure under section 112(d) of the Air Act (42 U.S.C. 7412(d)).

"Clean water standards," as used in this clause, means any enforceable limitation, control, condition, prohibition, standard, or other requirement promulgated under the Water Act or contained in a permit issued to a discharger by the Environmental Protection Agency or by a State under an approved program, as authorized by section 402 of the Water Act (33 U.S.C. 1342), or by local government to ensure compliance with pretreatment regulations as required by section 307 of the Water Act (33 U.S.C. 1317).

"Compliance," as used in this clause, means compliance with--

(1) Clean air or water standards; or

(2) A schedule or plan ordered or approved by a court of competent jurisdiction, the Environmental Protection Agency, or an air or water pollution control agency under the requirements of the Air Act or Water Act and related regulations.

"Facility," as used in this clause, means any building, plant, installation, structure, mine, vessel or other floating craft, location, or site of operations, owned, leased, or supervised by a Contractor or subcontractor, used in the performance of a contract or subcontract. When a location or site of operations includes more than one building, plant, installation, or structure,the entire location or site shall be deemed a facility except when the Administrator, or a designee, of the Environmental Protection Agency, determines that independent facilities are collocated in one geographical area.

"Water Act," as used in this clause, means Clean Water Act (33 U.S.C. 1251 et seq.).

(b) (1) To comply with all the requirements of section 114 of the Clean Air Act (42 U.S.C. 7414) and section 308 of the Clean Water Act (33 U.S.C. 1318) relating to inspection, monitoring, entry, reports, and information, as well as other requirements specified in section 114 and section 308 of the Air Act and the Water Act, and all regulations and guidelines issued to implement those acts before the award of this contract;

(2) That no portion of the work required by this prime contract will be performed in a facility listed on the Environmental Protection Agency List of Violating Facilities on the date when this contract was awarded unless and until the EPA eliminates the name of the facility from the listing;

(3) To use best efforts to comply with clean air standards and clean water standards at the facility in which the contract is being performed; and

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(4) To insert the substance of this clause into any nonexempt subcontract, including this subparagraph (b)(4).#

33. BUY AMERICAN ACT--CONSTRUCTION MATERIALS (1984 APR) FAR 52.225-5

(a) The Buy American Act (41 U.S.C. 10) provides that the Government give preference to domestic construction material.

"Components," as used in this clause, means those articles, materials, and supplies incorporated directly into construction materials.

"Construction materials," as used in this clause, means articles, materials, and supplies brought to the construction site for incorporation into the building or work.

"Domestic construction material," as used in this clause, means (1) an unmanufactured construction material mined or produced in the United States, or (2) a construction material manufactured in the United States, if the cost of its components mined, produced, or manufactured in the United States exceeds 50 percent of the cost of all its components. Components of foreign origin of the same class or kind as the construction materials determined to be unavailable pursuant to subparagraph 25.202(a)(3) of the Federal Acquisition Regulation (FAR) shall be treated as domestic.

(b) The Contractor agrees that only domestic construction material will be used by the Contractor, subcontractors, materialmen, and suppliers in the performance of this contract, except for foreign construction materials, if any, listed in this contract.

(The foregoing requirements are administered in accordance with Executive Order No. 10582, dated December 17, 1954, as amended, and Subpart 25.2 of the FAR).#

34. AUTHORIZATION AND CONSENT (APR 1984) FAR 52.227-1

(a) The Government authorizes and consents to all use and manufacture, in performing this contract or any subcontract at any tier, of any invention described in and covered by a United States patent (1) embodied in the structure or composition of any article the delivery of which is accepted by the Government under this contract or (2) used in machinery, tools, or methods whose use necessarily results from compliance by the Contractor or a subcontractor with (i) specifications or written provisions forming a part of this contract or (ii) specific written instructions given by the Contracting Officer directing the manner of performance. The entire liability to the Government for infringement of a patent of the United States shall be determined solely by the provisions of the indemnity clause, if any, included in this contract or any subcontract hereunder (including any lower-tier subcontract), and the Government assumes liability for all other infringement to the extent of the authorization and consent hereinabove granted.

(b) The Contractor agrees to include, and require inclusion of, this clause, suitably modified to identify the parties, in all subcontracts at any tier for supplies or services (including construction, architect-engineer services, and materials, supplies, models, samples, and design or testing services expected to exceed $25,000; however, omission of this clause from any subcontract, under or over $25,000, does not affect this authorization and consent.#

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35. NOTICE AND ASSISTANCE REGARDING PATENT AND COPYRIGHT INFRINGEMENT (APR 1984) FAR 52.227-2

(a) The Contractor shall report to the Contracting Officer, promptly and in reasonable written detail, each notice or claim of patent or copyright infringement based on the performance of this contract of which the Contractor has knowledge.

(b) In the event of any claim or suit against the Government on account of any alleged patent or copyright infringement arising out of the performance of this contract or out of the use of any supplies furnished or work or services performed under this contract, the Contractor shall furnish to the Government, when requested by the Contracting Officer, all evidence and information in possession of the Contractor pertaining to such suit or claim. Such evidence and information shall be furnished at the expense of the Government except where the Contractor has agreed to indemnify the Government.

(c) The Contractor agrees to include, and require inclusion of, this clause in all subcontracts at any tier for supplies or services (including construction and architect-engineer subcontracts and those for material, supplies, models, samples, or design or testing services) expected to exceed the dollar amount set forth in 13.000 of the Federal Acquisition Regulation (FAR).#

36. PATENT INDEMNITY-CONSTRUCTION CONTRACTS (APR 1984) FAR 52.227-4

Except as otherwise provided, the Contractor agrees to indemnify the Government and its officers, agents, and employees against liability, including costs and expenses, for infringement upon any United States patent (except a patent issued upon an application that is now or may hereafter be withheld from issue pursuant to a Secrecy Order under 35 U.S.C. 181) arising out of performing this contract or out of the use or disposal by or for the account of the Government of supplies furnished or work performed under this contract.#

37. ADDITIONAL BOND SECURITY (1984 APR) FAR 52.228-2

The Contractor shall promptly furnish additional security required to protect the Government and persons supplying labor or materials under this contract if--

(a) Any surety upon any bond furnished with this contract becomes unacceptable to the Government;

(b) Any surety fails to furnish reports on its financial condition as required by the Government; or

(c) The contract price is increased so that the penal sum of any bond becomes inadequate in the opinion of the Contracting Officer.#

38. INSURANCE--WORK ON A GOVERNMENT INSTALLATION (1984 APR) FAR 52.228-5

(The following clause is applicable if the services involved are performed on a Government installation.)

(a) The Contractor shall, at its own expense, provide and maintain during the entire performance period of this contract at least the kinds and minimum amounts of insurance required in the Schedule or elsewhere in the contract.

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(b) Before commencing work under this contract, the Contractor shall certify to the Contracting Officer in writing that the required insurance has been obtained. The policies evidencing required insurance shall contain an endorsement to the effect that any cancellation or any material change adversely affecting the Government's interest shall not be effective (1) for such period as the laws of the State in which this contract is to be performed prescribe or (2) until 30 days after the insurer or the Contractor gives written notice to the Contracting Officer, whichever period is longer.

(c) The Contractor shall insert the substance of this clause, including this paragraph (c), in subcontracts under this contract that require work on a Government installation and shall require subcontractors to provide and maintain the insurance required in the Schedule or elsewhere in the contract. At least 5 days before entry of each such subcontractor's personnel on the Government installation, the Contractor shall furnish (or ensure that there has been furnished) to the Contracting Officer a current certificate of insurance, meeting the requirements of paragraph (b) above, for each such subcontractor.

31. FEDERAL, STATE, AND LOCAL TAXES (1984 APR) FAR 52.229-3

(a) "Contract date," as used in this clause, means the date set for bid opening or, if this is a negotiated contract or a modification, the effective date of this contract or modification.

"All applicable Federal, State, and local taxes and duties," as used in this clause, means all taxes and duties, in effect on the contract date, that the taxing authority is imposing and collecting on the transactions or property covered by this contract.

"After-imposed Federal tax," as used in this clause, means any new or increased Federal excise tax or duty, or tax that was exempted or excluded on the contract date but whose exemption was later revoked or reduced during the contract period, on the transactions or property covered by this contract that the Contractor is required to pay or bear as the result of legislative, judicial, or administrative action taking effect after the contract date. It does not include social security tax or other employment taxes.

"After-relieved Federal tax," as used in this clause, means any amount of Federal excise tax or duty, except social security or other employment taxes, that would otherwise have been payable on the transactions or property covered by this contract, but which the Contractor is not required to pay or bear, or for which the Contractor obtains a refund or drawback, as the result of legislative, judicial, or administrative action taking effect after the contract date.

(b) The contract price includes all applicable Federal, State, and local taxes and duties.

(c) The contract price shall be increased by the amount of any after-imposed Federal tax, provided the Contractor warrants in writing that no amount for such newly imposed Federal excise tax or duty or rate increase was included in the contract price, as a contingency reserve or otherwise.

(d) The contract price shall be decreased by the amount of any after-relieved Federal tax.

(e) The contract price shall be decreased by the amount of any Federal excise tax or duty, except social security or other employment taxes that the Contractor is required to pay or bear, or does not

obtain a refund of, through the Contractor's fault, negligence, failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds $100.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.

40. PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS
(1984 APR) FAR 52.232-5

(a) The Government shall pay the Contractor the contract price as provided in this contract.

(b) The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration if--

(1) Consideration is specifically authorized by this contract; and

(2) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) In making these progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer may authorize payment to be made in full without retention of a percentage. When the work is substantially complete, the Contracting Officer shall retain an amount that the Contracting Officer considers adequate protection of the Government and may release to the Contractor all or a portion of any excess amount. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment may be made for the completed work without retention of a percentage.

(d) All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

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obtain a refund of, through the Contractor's fault, negligence, or failure to follow instructions of the Contracting Officer.

(f) No adjustment shall be made in the contract price under this clause unless the amount of the adjustment exceeds $100.

(g) The Contractor shall promptly notify the Contracting Officer of all matters relating to any Federal excise tax or duty that reasonably may be expected to result in either an increase or decrease in the contract price and shall take appropriate action as the Contracting Officer directs.

(h) The Government shall, without liability, furnish evidence appropriate to establish exemption from any Federal, State, or local tax when the Contractor requests such evidence and a reasonable basis exists to sustain the exemption.#

40. PAYMENTS UNDER FIXED-PRICE CONSTRUCTION CONTRACTS (1984 APR) FAR 52.232-5

(a) The Government shall pay the Contractor the contract price as provided in this contract.

(b) The Government shall make progress payments monthly as the work proceeds, or at more frequent intervals as determined by the Contracting Officer, on estimates approved by the Contracting Officer. If requested by the Contracting Officer, the Contractor shall furnish a breakdown of the total contract price showing the amount included therein for each principal category of the work, in such detail as requested, to provide a basis for determining progress payments. In the preparation of estimates the Contracting Officer may authorize material delivered on the site and preparatory work done to be taken into consideration. Material delivered to the Contractor at locations other than the site may also be taken into consideration if--

(1) Consideration is specifically authorized by this contract; and

(2) The Contractor furnishes satisfactory evidence that it has acquired title to such material and that the material will be used to perform this contract.

(c) In making these progress payments, there shall be retained 10 percent of the estimated amount until final completion and acceptance of the contract work. However, if the Contracting Officer finds that satisfactory progress was achieved during any period for which a progress payment is to be made, the Contracting Officer may authorize payment to be made in full without retention of a percentage. When the work is substantially complete, the Contracting Officer shall retain an amount that the Contracting Officer considers adequate protection of the Government and may release to the Contractor all or a portion of any excess amount. Also, on completion and acceptance of each separate building, public work, or other division of the contract, for which the price is stated separately in the contract, payment may be made for the completed work without retention of a percentage.

(d) All material and work covered by progress payments made shall, at the time of payment, become the sole property of the Government, but this shall not be construed as--

(1) Relieving the Contractor from the sole responsibility for all material and work upon which payments have been made or the restoration of any damaged work; or

(2) Waiving the right of the Government to require the fulfillment of all of the terms of the contract.

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(e) The Government shall, upon request, reimburse the Contractor for the entire amount of premiums paid for performance and payment bonds (including coinsurance and reinsurance agreements, when applicable) after furnishing evidence of full payment to the surety.

(f) The Government shall pay the amount due the Contractor under this contract after--

(1) Completion and acceptance of all work;

(2) Presentation of a properly executed voucher; and

(3) Presentation of release of all claims against the Government arising by virtue of this contract, other than claims, in stated amounts, that the Contractor has specifically excepted from the operation of the release. A release may also be required of the assignee if the Contractor's claim to amounts payable under this contract has been assigned under the Assignment of Claims Act of 1940 (31 U.S.C. 203 and 41 U.S.C. 15).

41. INTEREST (APR 1984) FAR 52.232-17

(a) Notwithstanding any other clause of this contract, all amounts that become payable by the Contractor to the Government under this contract (net of any applicable tax credit under the Internal Revenue Code (26 U.S.C. 1481)) shall bear simple interest from the date due until paid unless paid within 30 days of becoming due. The interest rate shall be the interest rate established by the Secretary of the Treasury as provided in Section 12 of the Contract Disputes Act of 1978 (Public Law 95-563), which is applicable to the period in which the amount becomes due, as provided in paragraph (b) of this clause, and then at the rate applicable for each six-month period as fixed by the Secretary until the amount is paid.

(b) Amounts shall be due at the earliest of the following dates:

(1) The date fixed under this contract.

(2) The date of the first written demand for payment consistent with this contract, including any demand resulting from a default termination.

(3) The date the Government transmits to the Contractor a proposed supplemental agreement to confirm completed negotiations establishing the amount of debt.

(4) If this contract provides for revision of prices, the date of written notice to the Contractor stating the amount of refund payable in connection with a pricing proposal or a negotiated pricing agreement not confirmed by contract modification.

(c) The interest charge made under this clause may be reduced under the procedures prescribed in 32.614-2 of the Federal Acquisition Regulation in effect on the date of this contract.

42. ASSIGNMENT OF CLAIMS (1984 APR) FAR 52.232-23

(a) The Contractor, under the Assignment of Claims Act, as amended, 31 U.S.C. 203, 41 U.S.C. 15 (hereafter referenced to as the "the Act"), may assign its rights to be paid amounts due or to become due as a result of the performance of this contract to a bank, trust company, or other financing institution, including any Federal lending agency. The assignee under such an assignment may thereafter further assign or reassign its right under the original assignment to any type of financing institution described in the preceding sentence.

(b) Any assignment or reassignment authorized under the Act and this clause shall cover all unpaid amounts payable under this contract, and shall not be made to more than one party, except that an

assignment or reassignment may be made to one party as agent or trustee for two or more parties participating in the financing of this contract.

(c) The Contractor shall not furnish or disclose to any assignee under this contract any classified document (including this contract) or information related to work under this contract until the Contracting Officer authorizes such action in writing.#

43. DISPUTES (1984 APR) FAR 52.233-1

(a) This contract is subject to the Contract Disputes Act of 1978 (41 U.S.C. 601-613)(the Act).

(b) Except as provided in the Act, all disputes arising under or relating to this contract shall be resolved under this clause.

(c) "Claim," as used in this clause, means a written demand or written assertion by one of the contracting parties seeking, as a matter of right, the payment of money in a sum certain, the adjustment or interpretation of contract terms, or other relief arising under or relating to this contract. A claim arising under a contract, unlike a claim relating to that contract, is a claim that can be resolved under a contract clause that provides for the relief sought by the claimant. However, a written demand or written assertion by the Contractor seeking the payment of money exceeding $50,000 is not a claim under the Act until certified as required by subparagraph (d)(2) below. A voucher, invoice, or other routine request for payment that is not in dispute when submitted is not a claim under the Act. The submission may be converted to a claim under the Act, by complying with the submission and certification requirements of this clause, if it is disputed either as to liability or amount or is not acted upon in a reasonable time.

(d) (1) A claim by the Contractor shall be made in writing and submitted to the Contracting Officer for a written decision. A claim by the Government against the Contractor shall be subject to a written decision by the Contracting Officer.

(2) For Contractor claims exceeding $50,000, the Contractor shall submit with the claim a certification that--

(i) The claim is made in good faith;

(ii) Supporting data are accurate' and complete to the best of the Contractor s knowledge and belief; and

(iii) The amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable.

(3) (i) If the Contractor is an individual, the certification shall be executed by that individual.

(ii) If the Contractor is not an individual, the certification shall be executed by--

(A) A senior company official in charge at the Contractor's plant or location involved; or

(B) An officer or general partner of the Contractor having overall responsibility for the conduct of the Contractor's affairs.

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(e) For Contractor claims of $50,000 or less, the Contracting Officer must, if requested in writing by the Contractor, render a decision within 60 days of the request. For Contractor-certified claims over $50,000, the Contracting Officer must, within 60 days, decide the claim or notify the Contractor of the date by which the decision will be made.

(f) The Contracting Officer's decision shall be final unless the Contractor appeals or files a suit as provided in the Act.

(g) The Government shall pay interest on the amount found due and unpaid from (1) the date the Contracting Officer receives the claim (properly certified if required), or (2) the date payment otherwise would be due, if that date is later, until the date of payment. Simple interest on claims shall be paid at the rate, fixed by the Secretary of the Treasury as provided in the Act, which is applicable to the period during which the Contracting Officer receives the claim and then at the rate applicable for each 6-month period as fixed by the Treasury Secretary during the pendency of the claim.

(h) The Contractor shall proceed diligently with performance of this contract, pending final resolution of any request for relief, claim, appeal, or action arising under the contract, and comply with any decision of the Contracting Officer.#

44. DIFFERING SITE CONDITIONS (1984 APR) FAR 52.236-2

(a) The Contractor shall promptly, and before the conditions are disturbed, give a written notice to the Contracting Officer of (1) subsurface or latent physical conditions at the site which differ materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, which differ materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in the contract.

(b) The Contracting Officer shall investigate the site conditions promptly after receiving the notice. If the conditions do materially so differ and cause an increase or decrease in the Contractor's cost of, or the time required for, performing any part of the work under this contract, whether or not changed as a result of the conditions, an equitable adjustment shall be made under this clause and the contract modified in writing accordingly.

(c) No request by the Contractor for an equitable adjustment to the contract under this clause shall be allowed, unless the Contractor has given the written notice required; provided, that the time prescribed in (a) above for giving written notice may be extended by the Contracting Officer.

(d) No request by the Contractor for an equitable adjustment to the contract for differing site conditions shall be allowed if made after final payment under this contract.#

45. SITE INVESTIGATION AND CONDITIONS AFFECTING THE WORK (1984 APR) FAR 52.236-3

(a) The Contractor acknowledges that it has taken steps reasonably necessary to ascertain the nature and location of the work, and that it has investigated and satisfied itself as to the general and local conditions which can affect the work or its cost, including but not limited to (1) conditions bearing upon transportation, disposal, handling, and storage of materials; (2) the availability of labor, water, electric power, and roads; (3) uncertainties of weather, river stages, tides, or similar physical conditions at the

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site; (4) the conformation and conditions of the ground; and (5) the character of equipment and facilities needed preliminary to and during work performance. The Contractor also acknowledges that it has satisfied itself as to the character, quality, and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, including all exploratory work done by the Government, as well as from the drawings and specifications made a part of this contract. Any failure of the Contractor to take the actions described and acknowledged in this paragraph will not relieve the Contractor from responsibility for estimating properly the difficulty and cost of successfully performing the work, or for proceeding to successfully perform the work without additional expense to the Government.

(b) The Government assumes no responsibility for any conclusions or interpretations made by the Contractor based on the information made available by the Government. Nor does the Government assume responsibility for any understanding reached or representation made concerning conditions which can affect the work by any of its officers or agents before the execution of this contract, unless that understanding or representation is expressly stated in this contract.#

46. MATERIAL AND WORKMANSHIP (APR 1984) FAR 52.236-5

(a) All equipment, material, and articles incorporated into the work covered by this contract shall be new and of the most suitable grade for the purpose intended, unless otherwise specifically provided in this contract. References in the specifications to equipment, material, articles, or patented processes by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. The Contractor may, at its option, use any equipment, material, article, or process that, in the judgment of the Contracting Officer, is equal to that named in the specifications, unless otherwise specifically provided in this contract.

(b) The Contractor shall obtain the Contracting Officer's approval of the machinery and mechanical and other equipment to be incorporated into the work. When requesting approval, the Contractor shall furnish to the Contracting Officer the name of he manufacturer, the model number, and other information concerning the performance, capacity, nature, and rating of the machinery and mechanical and other equipment. When required by this contract or by the Contracting Officer, the Contractor shall also obtain the Contracting Officer's approval of the material or articles which the Contractor contemplates incorporating into the work. When requesting approval, the Contractor shall provide full information concerning the material or articles. When directed to do so, the Contractor shall submit samples for approval at the Contractor's expense, with all shipping charges prepaid. Machinery, equipment, material, and articles that do not have the required approval shall be installed or used at the risk of subsequent rejection.

(c) All work under this contract shall be performed in a skillful and workmanlike manner. The Contracting Officer may require, in writing, that the Contractor remove from the work any employee the Contracting Officer deems incompetent, careless, or otherwise objectionable.#

ORIGINA
(Red)

47. SUPERINTENDENCE BY THE CONTRACTOR (1984 APR) FAR 52.236-6

At all times during performance of this contract and until the work is completed and accepted, the Contractor shall directly superintend the work or assign and have on the work a competent superintendent who is satisfactory to the Contracting Officer and has authority to act for the Contractor.#

48. PERMITS AND RESPONSIBILITIES (1984 APR) FAR 52.236-7

The Contractor shall, without additional expense to the Government, be responsible for obtaining any necessary licenses and permits, and for complying with any Federal, State, and municipal laws, codes, and regulations applicable to the performance of the work. The Contractor shall also be responsible for all damages to persons or property that occur as a result of the Contractor's fault or negligence, and shall take proper safety and health precautions to protect the work, the workers, the public, and the property of others. The Contractor shall also be responsible for all materials delivered and work performed until completion and acceptance of the entire work, except for any completed unit of work which may have been accepted under the contract.#

49. OTHER CONTRACTS (1984 APR) FAR 52.236-8

The Government may undertake or award other contracts for additional work at or near the site of the work under this contract. The Contractor shall fully cooperate with the other contractors and with Government employees and shall carefully adapt scheduling and performing the work under this contract to accommodate the additional work, heeding any direction that may be provided by the Contracting Officer. The Contractor shall not commit or permit any action that will interfere with the performance of work by any other contractor or by Government employees.#

50. PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (1984 APR) FAR 52.236-9

(a) The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.

(b) The Contractor shall protect from damage all existing improvements and utilities (1) at or near the work site and (2) on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contractor may have the necessary work performed and charge the cost to the Contractor.#

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51. OPERATIONS AND STORAGE AREAS (1984 APR) FAR 52.236-10

(a) The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.

(b) Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.

(c) The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.#

52. USE AND POSSESSION PRIOR TO COMPLETION (1984 APR) FAR 52.236-11

(a) The Government shall have the right to take possession of or use any completed or partially completed part of the work. Before taking possession of or using any work, the Contracting Officer shall furnish the Contractor a list of items of work remaining to be performed or corrected on those portions of the work that the Government intends to take possession of or use. However, failure of the Contracting Officer to list any item of work shall not relieve the Contractor of responsibility for complying with the terms of the contract. The Government's possession or use shall not be deemed an acceptance of any work under the contract.

(b) While the Government has such possession or use, the Contractor shall be relieved of the responsibility for the loss of or damage to the work resulting from the Government's possession or use, notwithstanding the terms of the clause in this contract entitled "Permits and Responsibilities." If prior possession or use by the Government delays the progress of the work or causes additional expense to the Contractor, an equitable adjustment shall be made in the contract price or the time of completion, and the contract shall be modified in writing accordingly.#

53. CLEANING UP (1984 APR) FAR 52.236-12

The Contractor shall at all times keep the work area, including storage areas, free from accumulations of waste materials. Before completing the work, the Contractor shall remove from the work and premises any rubbish, tools, scaffolding, equipment, and materials that are not the property of the Government. Upon completing the work, the Contractor shall leave the work area in a clean, neat, and orderly condition satisfactory to the Contracting Officer.#

ORIGINAL (2nd)

54. ACCIDENT PREVENTION (ALTERNATE I) (1984 APR) FAR 52.236-13

(a) In performing this contract, the Contractor shall provide for protecting the lives and health of employees and other persons; preventing damage to property, materials, supplies, and equipment; and avoiding work interruptions. For these purposes, the Contractor shall--

(1) Provide appropriate safety barricades, signs, and signal lights;

(2) Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910; and

(3) Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for this purpose are taken.

(b) If this contract is with any Department of Defense agency or component, the Contractor shall comply with all pertinent provisions of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, dated April 1981.

(c) The Contractor shall maintain an accurate record of exposure data on all accidents incident to work performed under this contract resulting in death, traumatic injury, occupational disease, or damage to property, materials, supplies, or equipment. The Contractor shall report this data in the manner prescribed by the Contracting Officer.

(d) The Contracting Officer shall notify the Contractor of any noncompliance with these requirements and of the corrective action required. This notice, when delivered to the contractor or the Contractor's representative at the site of the work, shall be deemed sufficient notice of the noncompliance and corrective action required. After receiving the notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to take corrective action promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not base any claim or request for equitable adjustment for additional time or money on any stop order issued under these circumstances.

(e) The Contractor shall be responsible for its subcontractors' compliance with this clause.

(f) Before commencing the work, the Contractor shall--

(1) Submit a written proposal for implementing this clause; and

(2) Meet with representatives of the Contracting Officer to discuss and develop a mutual understanding relative to administration of the overall safety program.#

55. SCHEDULE FOR CONSTRUCTION CONTRACTS (1984 APR) FAR 52.236-15

(a) The Contractor shall, within five days after the work commences on the contract or another period of time determined by the Contracting Officer, prepare and submit to the Contracting Officer for approval three copies of a practicable schedule showing the order in which the Contractor proposes to perform the work, and the dates on which the Contractor contemplates starting and completing the several salient features of the work (including acquiring materials, plant, and equipment). The schedule shall be in the form of a progress chart of suitable scale to indicate appropriately the percentage of work scheduled for completion by any given date during the period. If the

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Contractor fails to submit a schedule within the time prescribed, the Contracting Officer may withhold approval of progress payments until the Contractor submits the required schedule.

(b) The Contractor shall enter the actual progress on the chart as directed by the Contracting Officer, and upon doing so shall immediately deliver three copies of the annotated schedule to the Contracting Officer. If, in the opinion of the Contracting Officer, the Contractor falls behind the approved schedule, the Contractor shall take steps necessary to improve its progress, including those that may be required by the Contracting Officer, without additional cost to the Government. In this circumstance, the Contracting Officer may require the Contractor to increase the number of shifts, overtime operations, days of work, and/or the amount of construction plant, and to submit for approval any supplementary schedule or schedules in chart form as the Contracting Officer deems necessary to demonstrate how the approved rate of progress will be regained.

(c) Failure of the Contractor to comly with the requirements of the Contracting Officer under this clause shall be grounds for a determination by the Contracting Officer that the Contractor is not prosecuting the work with sufficient diligence to ensure completion within the time specified in the contract. Upon making this determination, the Contracting Officer may terminate the Contractor's right to proceed with the work, or any separable part of it, in accordance with the default terms of this contract.#

56. SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (1984 APR) FAR 52.236-21

(a) The Contractor shall keep on the work site a copy of the drawings and specifications and shall at all times give the Contracting Officer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications, shall be of like effect as if shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. In case of discrepancy in the figures, in the drawings, or in the specifications, the matter shall be promptly submitted to the Contracting Officer, who shall promptly make a determination in writing. Any adjustment by the Contractor without such a determination shall be at its own risk and expense. The Contracting Officer shall furnish from time to time such detailed drawings and other information as considered necessary, unless otherwise provided.

(b) Wherever in the specifications or upon the drawings the words "directed", "required", "ordered", "designated", "prescribed", or words of like import are used, it shall be understood that the "direction", "requirement", "order", "designation", or "prescription", of the Contracting Officer is intended and similarly the words "approved", "acceptable", "satisfactory", or words of like import shall mean "approved by", or "acceptable to", or "satisfactory to" the Contracting Officer, unless otherwise expressly stated.

(c) Where "as shown", "as indicated", "as detailed", or words of similar import are used, it shall be understood that the reference is made to the drawings accompanying this contract unless stated otherwise. The word "provided" as used herein shall be understood to mean "provide complete in place", that is "furnished and installed".

(d) Shop drawings means drawings, submitted to the Government by the Contractor, subcontractor, any lower tier subcontractor pursuant to a construction contract, showing in detail (1) the proposed fabrication and assembly of structural elements and (2) the installation (i.e., form, fit, and attachment details) of materials of equipment. It includes drawings, diagrams, layouts, schematics, descriptive literature, illustrations, schedules, performance and test data, and similar materials furnished by the Contractor to explain in detail specific portions of the work required by the contract. The Government may duplicate, use, and disclose in any manner and for any purpose shop drawings delivered under this contract.

(e) If this contract requires shop drawings, the Contractor shall coordinate all such drawings, and review them for accuracy, completeness, and compliance with contract requirements and shall indicate its approval thereon as evidence of such coordination and review. Shop drawings submitted to the Contracting Officer without evidence of the Contractor's approval may be returned for resubmission. The Contracting Officer will indicate an approval or disapproval of the shop drawings and if not approved as submitted shall indicate the Government's reasons therefor. Any work done before such approval shall be at the Contractor's risk. Approval by the Contracting Officer shall not relieve the Contractor from responsibility for any errors or omissions in such drawings, nor from responsibility for complying with the requirements of this contract, except with respect to variations described and approved in accordance with (f) below.

(f) If shop drawings show variations from the contract requirements, the Contractor shall describe such variations in writing, separate from the drawings, at the time of submission. If the Contracting Officer approves any such variation, the Contracting Officer shall issue an appropriate contract modification, except that, if the variation is minor or does not involve a change in price or in time of performance, a modification need not be issued.

(g) The Contractor shall submit to the Contracting Officer for approval four copies (unless otherwise indicated) of all shop drawings as called for under the various headings of these specifications. Three sets (unless otherwise indicated) of all shop drawings, will be retained by the Contracting Officer and one set will be returned to the Contractor.

(h) This clause shall be included in all subcontracts at any tier.#

57. CHANGES (1984 APR) FAR 52.243-4

(a) The Contracting Officer may, at any time, without notice to the sureties, if any, by written order designated or indicated to be a change order, make changes in the work within the general scope of the contract, including changes--

(1) In the specifications (including drawings and designs);

(2) In the method or manner of performance of the work;

(3) In the Government-furnished facilities, equipment, materials, services, or site; or

(4) Directing acceleration in the performance of the work.

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(b) Any other written or oral order (which, as used in this paragraph (b), includes direction, instruction, interpretation, or determination) from the Contracting Officer that causes a change shall be treated as a change order under this clause; provided, that the Contractor gives the Contracting Officer written notice stating (1) the date, circumstances, and source of the order and (2) that the Contractor regards the order as a change order.

(c) Except as provided in this clause, no order, statement, or conduct of the Contracting Officer shall be treated as a change under this clause or entitle the Contractor to an equitable adjustment.

(d) If any change under this clause causes an increase or decrease in the Contractor's cost of, or the time required for, the performance of any part of the work under this contract, whether or not changed by any such order, the Contracting Officer shall make an equitable adjustment and modify the contract in writing. However, except for a "proposal for adjustment" (hereafter referred to as proposal) based on defective specifications, no proposal for any change under paragraph (b) above shall be allowed for any costs incurred more than 20 days before the Contractor gives written notice as required. In the case of defective specifications for which the Government is responsible, the equitable adjustment shall include any increased cost reasonably incurred by the Contractor in attempting to comply with the defective specifications.

(e) The Contractor must submit any proposal under this clause within 30 days after (1) receipt of a written change order under paragraph (a) above or (2) the furnishing of a written notice under paragraph (b) above, by submitting to the Contracting Officer a written statement describing the general nature and amount of the proposal, unless this period is extended by the Government. The statement of proposal for adjustment may be included in the notice under paragraph (b) above.

(f) No proposal by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.#

58. SUBCONTRACTS UNDER FIXED-PRICE CONTRACTS (1984 APR)
FAR 52.244-1

(The following clause is applicable if this contract is in excess of $500,000.)

(a) This clause does not apply to firm-fixed-price contracts and fixed-price contracts with economic price adjustment. However, it does apply to subcontracts resulting from unpriced modifications to such contracts.

(b) "Subcontract," as used in this clause, includes but is not limited to purchase orders, and changes and modifications to purchase orders. The Contractor shall notify the Contracting Officer reasonably in advance of entering into any subcontract if the Contractor does not have an approved purchasing system and if the subcontract--

(1) Is to be a cost-reimbursement, time-and-materials, or labor-hour contract estimated to exceed $25,000 including any fee;

(2) Is proposed to exceed $100,000; or

(3) Is one of a number of subcontracts with a single subcontractor, under this contract, for the same or related supplies or services, that in the aggregate are expected to exceed $100,000.

(c) The advance notification required by paragraph (b) above shall include--

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(1) A description of the supplies or services to be subcontracted;

(2) Identification of the type of subcontract to be used;

(3) Identification of the proposed subcontractor and an explanation of why and how the proposed subcontractor was selected, including the competition obtained;

(4) The proposed subcontract price and the Contractor's cost or price analysis;

(5) The subcontractor's current, complete, and accurate cost or pricing data and Certificate of Current Cost or Pricing Data, if required by other contract provisions;

(6) The subcontractor's Disclosure Statement or Certificate relating to Cost Accounting Standards when such data are required by other provisions of this contract; and

(7) A negotiation memorandum reflecting--

(i) The principal elements of the subcontract price negotiations;

(ii) The most significant considerations controlling establishment of initial or revised prices;

(iii) The reason cost or pricing data were or were not required;

(iv) The extent, if any, to which the Contractor did not rely on the subcontractor's cost or pricing data in determining the price objective and in negotiating the final price;

(v) The extent, if any, to which it was recognized in the negotiation that the subcontractor's cost or pricing data were not accurate, complete, or current; the action taken by the Contractor and subcontractor; and the effect of any such defective data on the total price negotiated;

(vi) The reasons for any significant difference between the Contractor's price objective and the price negotiated; and

(vii) A complete explanation of the incentive fee or profit plan when incentives are used. The explanation shall identify each critical performance element, management decisions used to quantify each incentive element, reasons for the incentives, and a summary of all trade-off possibilities considered.

(d) The Contractor shall obtain the Contracting Officer's written consent before placing any subcontract for which advance notification is required under paragraph (b) above. However, the Contracting Officer may ratify in writing any such subcontract. Ratification shall constitute the consent of the Contracting Officer.

(e) Even if the Contractor's purchasing system has been approved, the Contractor shall obtain the Contracting Officer's written consent before placing subcontracts that have been selected for special surveillance and so identified in the Schedule of this contract.

(f) Unless the consent or approval specifically provides otherwise, neither consent by the Contracting Officer to any subcontract nor approval of the Contractor's purchasing system shall

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constitute a determination (1) of the acceptability of any subcontract terms or conditions, (2) of the acceptability of any subcontract price or of any amount paid under any subcontract, or (3) to relieve the Contractor of any responsibility for performing this contract.

(g) No subcontract placed under this contract shall provide for payment on a cost-plus-a-percentage-of-cost basis, and any fee payable under cost-reimbursement subcontracts shall not exceed the fee limitations in subsection 16.301-4 of the Federal Acquisition Regulation (FAR).

(h) The Government reserves the right to review the Contractor's purchasing system as set forth in FAR Subpart 44.3.#

59.1 GOVERNMENT PROPERTY (FIXED-PRICE CONTRACTS) (1984 APR)
FAR 52.245-2

(The following clause is applicable when Government Property having an acquisition cost in excess of $50,000 is furnished to or acquired by the Contractor.)

(a) **Government-furnished property.**

(1) The Government shall deliver to the Contractor, for use in connection with and under the terms of this contract, the Government-furnished property described in the Schedule or specifications together with any related data and information that the Contractor may request and is reasonably required for the intended use of the property (hereinafter referred to as "Government-furnished property").

(2) The delivery or performance dates for this contract are based upon the expectation that Government-furnished property suitable for use (except for property furnished "as-is") will be delivered to the Contractor at the times stated in the Schedule or, if not so stated, in sufficient time to enable the Contractor to meet the contract's delivery or performance dates.

(3) If Government-furnished property is received by the Contractor in a condition not suitable for the intended use, the Contractor shall, upon receipt of it, notify the Contracting Officer, detailing the facts, and, as directed by the Contracting Officer and at Government expense, either repair, modify, return, or otherwise dispose of the property. After completing the directed action and upon written request of the Contractor, the Contracting Officer shall make an equitable adjustment as provided in paragraph (h) of this clause.

(4) If Government-furnished property is not delivered to the Contractor by the required time, the Contracting Officer shall, upon the Contractor's timely written request, make a determination of the delay, if any, caused the Contractor and shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(b) **Changes in Government-furnished property.**

(1) The Contracting Officer may, by written notice, (i) decrease the Government-furnished property provided or to be provided under this contract, or (ii) substitute other Government-furnished property for the property to be provided by the Government, or to be acquired by the Contractor for the Government, under this contract. The Contractor shall promptly take such action as the Contracting Officer may direct regarding the removal, shipment, or disposal of the property covered by such notice.

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ORIGINAL (Red)

(2) Upon the Contractor's written request, the Contracting Officer shall make an equitable adjustment to the contract in accordance with paragraph (h) of this clause, if the Government has agreed in the Schedule to make the property available for performing this contract and there is any--

(i) Decrease or substitution in this property pursuant to subparagraph (b)(1) above; or

(ii) Withdrawal of authority to use this property, if provided under any other contract or lease.

(c) **Title in Government property.**

(1) The Government shall retain title to all Government-furnished property.

(2) All Government-furnished property and all property acquired by the Contractor, title to which vests in the Government under this paragraph (collectively referred to as "Government property"), are subject to the provisions of this clause. Title to Government property shall not be affected by its incorporation into or attachment to any property not owned by the Government, nor shall Government property become a fixture or lose its identity as personal property by being attached to any real property.

(3) Title to each item of facilities, special test equipment, and special tooling (other than that subject to a special tooling clause) acquired by the Contractor for the Government under this contract shall pass to and vest in the Government when its use in performing this contract commences or when the Government has paid for it, whichever is earlier, whether or not title previously vested in the Government.

(4) If this contract contains a provision directing the Contractor to purchase material for which the Government will reimburse the Contractor as a direct item of cost under this contract--

(i) Title to material purchased from a vendor shall pass to and vest in the Government upon the vendor's delivery of such material; and

(ii) Title to all other material shall pass to and vest in the Government upon--

(A) Issuance of the material for use in contract performance;

(B) Commencement of processing of the material or its use in contract performance; or

(C) Reimbursement of the cost of the material by the Government, whichever occurs first.

(d) **Use of Government property.** The Government property shall be used only for performing this contract, unless otherwise provided in this contract or approved by the Contracting Officer.

(e) **Property administration.**

(1) The Contractor shall be responsible and accountable for all Government property provided under this contract and shall comply with Federal Acquisition Regulation (FAR) Subpart 45.5, as in effect on the date of this contract.

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(2) The Contractor shall establish and maintain a program for the use, maintenance, repair, protection, and preservation of Government property in accordance with sound industrial practice and the applicable provisions of Subpart 45.5 of the FAR.

(3) If damage occurs to Government property, the risk of which has been assumed by the Government under this contract, the Government shall replace the items or the Contractor shall make such repairs as the Government directs. However, if the Contractor cannot effect such repairs within the time required, the Contractor shall dispose of the property as directed by the Contracting Officer. When any property for which the Government is responsible is replaced or repaired, the Contracting Officer shall make an equitable adjustment in accordance with paragraph (h) of this clause.

(4) The Contractor represents that the contract price does not include any amount for repairs or replacement for which the Government is responsible. Repair or replacement of property for which the Contractor is responsible shall be accomplished by the Contractor at its own expense.

(f) **Access.** The Government and all its designees shall have access at all reasonable times to the premises in which any Government property is located for the purpose of inspecting the Government property.

(g) **Risk of loss.** Unless otherwise provided in this contract, the Contractor assumes the risk of, and shall be responsible for, any loss or destruction of, or damage to, Government property upon its delivery to the Contractor or upon passage of title to the Government under paragraph (c) of this clause. However, the Contractor is not responsible for reasonable wear and tear to Government property or for Government property properly consumed in performing this contract.

(h) **Equitable adjustment.** When this clause specifies an equitable adjustment, it shall be made to any affected contract provision in accordance with the procedures of the Changes clause. When appropriate, the Contracting Officer may initiate an equitable adjustment in favor of the Government. The right to an equitable adjustment shall be the Contractor's exclusive remedy. The Government shall not be liable to suit for breach of contract for--

(1) Any delay in delivery of Government-furnished property;

(2) Delivery of Government-furnished property in a condition not suitable for its intended use;

(3) A decrease in or substitution of Government-furnished property; or

(4) Failure to repair or replace Government property for which the Government is responsible.

(i) **Final accounting and disposition of Government property.** Upon completing this contract, or at such earlier dates as may be fixed by the Contracting Officer, the Contractor shall submit, in a form acceptable to the Contracting Officer, inventory schedules covering all items of Government property (including any resulting scrap) not consumed in performing this contract or delivered to the Government. The Contractor shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property as may be directed or authorized by the Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as the Contracting Officer directs.

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(j) **Abandonment and restoration of Contractor's premises.** Unless otherwise provided herein, the Government--

(1) May abandon any Government property in place, at which time all obligations of the Government regarding such abandoned property shall cease; and

(2) Has no obligation to restore or rehabilitate the Contractor's premises under any circumstances (e.g., abandonment, disposition upon completion of need, or upon contract completion). However, if the Government-furnished property (listed in the Schedule or specifications) is withdrawn or is unsuitable for the intended use, or if other Government property is substituted, then the equitable adjustment under paragraph (h) of this clause may properly include restoration or rehabilitation costs.

(k) **Communications.** All communications under this clause shall be in writing.

(l) **Overseas contracts.** If this contract is to be performed outside the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished", respectively.#

59.2 GOVERNMENT-FURNISHED PROPERTY (SHORT FORM) (1984 APR)
FAR 52.245-4

(The following clause is applicable when Government Property having an acquisition cost of $50,000 or less is furnished to or acquired by the Contractor.)

(a) The Government shall deliver to the Contractor, at the time and locations stated in this contract, the Government-furnished property described in the Schedule or specifications. If that property, suitable for its intended use, is not delivered to the Contractor, the Contracting Officer shall equitably adjust affected provisions of this contract in accordance with the Changes clause when--

(1) The Contractor submits a timely written request for an equitable adjustment; and

(2) The facts warrant an equitable adjustment.

(b) Title to Government-furnished property shall remain in the Government. The Contractor shall maintain adequate property control records in accordance with sound industrial practice and will make such records available for Government inspection at all reasonable times, unless the clause at Federal Acquisition Regulation 52.245-1, Property Records, is included in this contract.

(c) Upon delivery of Government-furnished property to the Contractor, the Contractor assumes the risk and responsibility for its loss or damage, except--

(1) For reasonable wear and tear;

(2) To the extent property is consumed in performing this contract; or

(3) As otherwise provided for by the provisions of this contract.

(d) Upon completing this contract, the Contractor shall follow the instructions of the Contracting Officer regarding the disposition of all Government-furnished property not consumed in performing this contract or previously delivered to the Government. The Contractor shall prepare for shipment, deliver f.o.b. origin, or dispose of the Government property, as may be directed or authorized by the

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Contracting Officer. The net proceeds of any such disposal shall be credited to the contract price or shall be paid to the Government as directed by the Contracting Officer.

(e) If this contract is to be performed outside the United States of America, its territories, or possessions, the words "Government" and "Government-furnished" (wherever they appear in this clause) shall be construed as "United States Government" and "United States Government-furnished", respectively.#

60. INSPECTION OF CONSTRUCTION (1984 APR) FAR 52.246-12

(a) Definition. "Work" includes, but is not limited to, materials, workmanship, and manufacture and fabrication of components.

(b) The Contractor shall maintain an adequate inspection system and perform such inspection as will ensure that the work called for by this contract conforms to contract requirements. The Contractor shall maintain complete inspection records and make them available to the Government. All work shall be conducted under the general direction of the Contracting Officer and is subject to Government inspection and test at all places and at all reasonable times before acceptance to ensure strict compliance with the terms of the contract.

(c) Government inspections and tests are for the sole benefit of the Government and do not--

(1) Relieve the Contractor of responsibility for providing adequate quality control measures;

(2) Relieve the Contractor of responsibility for damage to or loss of the material before acceptance;

(3) Constitute or imply acceptance; or

(4) Affect the continuing rights of the Government after acceptance of the completed work under paragraph (i) below.

(d) The presence or absence of a Government inspector does not relieve the Contractor from any contract requirement, nor is the inspector authorized to change any term or condition of the specification without the Contracting Officer's written authorization.

(e) The Contractor shall promptly furnish, without additional charge, all facilities, labor, and material reasonably needed for performing such safe and convenient inspections and tests as may be required by the Contracting Officer. The Government may charge to the Contractor any additional cost of inspection or test when work is not ready at the time specified by the Contractor for inspection or test, or when prior rejection makes reinspection or retest necessary. The Government shall perform all inspections and tests in a manner that will not unnecessarily delay the work. Special, full size, and performance tests shall be performed as described in the contract.

(f) The Contractor shall, without charge, replace or correct work found by the Government not to conform to contract requirements,unless in the public interest the Government consents to accept the work with an appropriate adjustment in contract price. The Contractor shall promptly segregate and remove rejected material from the premises.

(g) If the Contractor does not promptly replace or correct rejected work, the Government may (1) by contract or otherwise, replace or correct the work and charge the cost to the Contractor or (2) terminate for default the Contractor's right to proceed.

(h) If, before acceptance of the entire work, the Government decides to examine already completed work by removing it or tearing it out, the Contractor, on request, shall promptly furnish all necessary

facilities, labor, and material. If the work is found to be defective or nonconforming in any material respect due to the fault of the Contractor or its subcontractors, the Contractor shall defray the expenses of the examination and of satisfactory reconstruction. However, if the work is found to meet contract requirements, the Contracting Officer shall make an equitable adjustment for the additional services involved in the examination and reconstruction, including, if completion of the work was thereby delayed, an extension of time.

(i) Unless otherwise specified in the contract, the Government shall accept, as promptly as practicable after completion and inspection, all work required by the contract or that portion of the work the Contracting Officer determines can be accepted separately. Acceptance shall be final and conclusive except for latent defects, fraud, gross mistakes amounting to fraud, or the Government's rights under any warranty or guarantee.#

61. **VALUE ENGINEERING - CONSTRUCTION (1984 APR) FAR 52.248-3**

(The following clause is applicable if this contract is in excess of $100,000.)

(a) **General.** The Contractor is encouraged to develop, prepare, and submit value engineering change proposals (VECP's) voluntarily. The Contractor shall share in any instant contract savings realized from accepted VECP's, in accordance with paragraph (f) below.

(b) **Definitions.** "Collateral costs", as used in this clause, means agency costs of operation, maintenance, logistic support, or Government-furnished property.

"Collateral savings", as used in this clause, means those measurable net reductions resulting from a VECP in the agency's overall projected collateral costs, exclusive of acquisition savings, whether or not the acquisition cost changes.

"Contractor's development and implementation costs", as used in this clause, means those costs the Contractor incurs on a VECP specifically in developing, testing, preparing, and submitting the VECP, as well as those costs the Contractor incurs to make the contractual changes required by Government acceptance of a VECP.

"Government costs", as used in this clause, means those agency costs that result directly from developing and implementing the VECP, such as any net increases in the cost of testing, operations, maintenance, and logistic support. The term does not include the normal administrative costs of processing the VECP.

"Instant contract savings", as used in this clause, means the estimated reduction in Contractor cost of performance resulting from acceptance of the VECP, minus allowable Contractor's development and implementation costs, including subcontractors' development and implementation costs (see paragraph (h) below).

"Value engineering change proposal (VECP)" means a proposal that--

(1) Requires a change to this, the instant contract, to implement; and

(2) Results in reducing the contract price or estimated cost without impairing essential functions or characteristics; provided, that it does not involve a change--

(i) In deliverable end item quantities only; or

(ii) To the contract type only.

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(c) **VECP preparation.** As a minimum, the Contractor shall include in each VECP the information described in subparagraphs (1) through (7) below. If the proposed change is affected by contractually required configuration management or similar procedures, the instructions in those procedures relating to format, identification, and priority assignment shall govern VECP preparation. The VECP shall include the following:

(1) A description of the difference between the existing contract requirement and that proposed, the comparative advantages and disadvantages of each, a justification when an item's function or characteristics are being altered, and the effect of the change on the end item's performance.

(2) A list and analysis of the contract requirements that must be changed if the VECP is accepted, including any suggested specification revisions.

(3) A separate, detailed cost estimate for (i) the affected portions of the existing contract requirement and (ii) the VECP. The cost reduction associated with the VECP shall take into account the Contractor's allowable development and implementation costs, including any amount attributable to subcontracts under paragraph (h) below.

(4) A description and estimate of costs the Government may incur in implementing the VECP, such as test and evaluation and operating and support costs.

(5) A prediction of any effects the proposed change would have on collateral costs to the agency.

(6) A statement of the time by which a contract modification accepting the VECP must be issued in order to achieve the maximum cost reduction, noting any effect on the contract completion time or delivery schedule.

(7) Identification of any previous submissions of the VECP, including the dates submitted, the agencies and contract numbers involved, and previous Government actions, if known.

(d) **Submission.** The Contractor shall submit VECP's to the Resident Engineer at the worksite, with a copy to the Contracting Officer.

(e) **Government action.**

(1) The Contracting Officer shall notify the Contractor of the status of the VECP within 45 calendar days after the contracting office receives it. If additional time is required, the Contracting Officer shall notify the Contractor within the 45-day period and provide the reason for the delay and the expected date of the decision. The Government will process VECP's expeditiously; however, it shall not be liable for any delay in action upon a VECP.

(2) If the VECP is not accepted, the Contracting Officer shall notify the Contractor in writing, explaining the reasons for rejection. The Contractor may withdraw any VECP, in whole or in part, at any time before it is accepted by the Government. The Contracting Officer may require that the Contractor provide written notification before undertaking significant expenditures for VECP effort.

(3) Any VECP may be accepted, in whole or in part, by the Contracting Officer's award of a modification to this contract citing this clause. The Contracting Officer may accept the VECP, even though an agreement on price reduction has not been reached, by issuing the Contractor a notice to proceed with the change. Until a

notice to proceed is issued or a contract modification applies a VECP to this contract, the Contractor shall perform in accordance with the existing contract. The Contracting Officer's decision to accept or reject all or part of any VECP shall be final and not subject to the Disputes clause or otherwise subject to litigation under the Contract Disputes Act of 1978 (41 U.S.C. 601-613).

(f) **Sharing.**

(1) **Rates.** The Contractor's share of savings is determined by subtracting Government costs from instant contract savings and multiplying the result by (i) 55 percent for fixed-price contracts or (ii) 25 percent for cost-reimbursement contracts.

(2) **Payment.** Payment of any share due the Contractor for use of a VECP on this contract shall be authorized by a modification to this contract to--

(i) Accept the VECP;

(ii) Reduce the contract price or estimated cost by the amount of instant contract savings; and

(iii) Provide the Contractor's share of savings by adding the amount calculated under subparagraph (1) above to the contract price or fee.

(g) **Collateral savings.** If a VECP is accepted, the instant contract amount shall be increased by 20 percent of any projected collateral savings determined to be realized in a typical year of use after subtracting any Government costs not previously offset. However, the Contractor's share of collateral savings shall not exceed (1) the contract's firm-fixed-price or estimated cost, at the time the VECP is accepted, or (2) $100,000, whichever is greater. The Contracting Officer shall be the sole determiner of the amount of collateral savings, and that amount shall not be subject to the Disputes clause or otherwise subject to litigation under 41 U.S.C. 601-613.

(h) **Subcontracts.** The Contractor shall include an appropriate value engineering clause in any subcontract of $50,000 or more and may include one in subcontracts of lesser value. In computing any adjustment in this contract's price under paragraph (f) above, the Contractor's allowable development and implementation costs shall include any subcontractor's allowable development and implementation costs clearly resulting from a VECP accepted by the Government under this contract, but shall exclude any value engineering incentive payments to a subcontractor. The Contractor may choose any arrangement for subcontractor value engineering incentive payments; **provided**, that these payments shall not reduce the Government's share of the savings resulting from the VECP.

(i) **Data.** The Contractor may restrict the Government's right to use any part of a VECP or the supporting data by marking the following legend on the affected parts:

> "These data, furnished under the Value Engineering-Construction clause of contract _____, shall not be disclosed outside the Government or duplicated, used or disclosed, in whole or in part, for any purpose other than to evaluate a value engineering change proposal submitted under the clause. This restriction does not limit the Government's right to use

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information contained in these data if it has been obtained or is otherwise available from the Contractor or from another source without limitations."

If a VECP is accepted, the Contractor hereby grants the Government unlimited rights in the VECP and supporting data, except that, with respect to data qualifying and submitted as limited rights technical data, the Government shall have the rights specified in the contract modification implementing the VECP and shall appropriately mark the data. (The terms "unlimited rights" and "limited rights" are defined in Part 27 of the Federal Acquisition Regulation.)#

62. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (SHORT FORM) (1984 APR) FAR 52.249-1

(The following clause is applicable if this contract is not in excess of $100,000.).

The Contracting Officer, by written notice, may terminate this contract, in whole or in part, when it is in the Government's interest. If this contract is terminated, the rights, duties, and obligations of the parties, including compensation to the Contractor, shall be in accordance with Part 49 of the Federal Acquisition Regulation in effect on the date of this contract.#

63. TERMINATION FOR CONVENIENCE OF THE GOVERNMENT (FIXED-PRICE) (ALTERNATE I) (1984 APR) FAR 52.249-2

(The following clause is applicable if this contract is in excess of $100,000.)

(a) The Government may terminate performance of work under this contract in whole or, from time to time, in part if the Contracting Officer determines that a termination is in the Government's interest. The Contracting Officer shall terminate by delivering to the Contractor a Notice of Termination specifying the extent of termination and the effective date.

(b) After receipt of a Notice of Termination, and except as directed by the Contracting Officer, the Contractor shall immediately proceed with the following obligations, regardless of any delay in determining or adjusting any amounts due under this clause:

(1) Stop work as specified in the notice.

(2) Place no further subcontracts or orders (referred to as subcontracts in this clause) for materials, services, or facilities, except as necessary to complete the continued portion of the contract.

(3) Terminate all subcontracts to the extent they relate to the work terminated.

(4) Assign to the Government, as directed by the Contracting Officer, all right, title, and interest of the Contractor under the subcontracts terminated, in which case the Government shall have the right to settle or to pay any termination settlement proposal arising out of those terminations.

(5) With approval or ratification to the extent required by the Contracting Officer, settle all outstanding liabilities and termination settlement proposals arising from the termination of subcontracts; the approval or ratification will be final for purposes of this clause.

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(6) As directed by the Contracting Officer transfer title and deliver to the Government (i) the fabricated or unfabricated parts, work in process, completed work, supplies, and other material produced or acquired for the work terminated, and (ii) the completed or partially completed plans, drawings, information, and other property that, if the contract had been completed, would be required to be furnished to the Government.

(7) Complete performance of the work not terminated.

(8) Take any action that may be necessary, or that the Contracting Officer may direct, for the protection and preservation of the property related to this contract that is in the possession of the Contractor and in which the Government has or may acquire an interest.

(9) Use its best efforts to sell, as directed or authorized by the Contracting Officer, any property of the types referred to in subparagraph (6) above; provided, however, that the Contractor (i) is not required to extend credit to any purchaser and (ii) may acquire the property under the conditions prescribed by, and at prices approved by, the Contracting Officer. The proceeds of any transfer or disposition will be applied to reduce any payments to be made by the Government under this contract, credited to the price or cost of the work, or paid in any other manner directed by the Contracting Officer.

(c) After expiration of the plant clearance period as defined in Subpart 45.6 of the Federal Acquisition Regulation, the Contractor may submit to the Contracting Officer a list, certified as to quantity and quality, of termination inventory not previously disposed of, excluding items authorized for disposition by the Contracting Officer. The Contractor may request the Government to remove those items or enter into an agreement for their storage. Within 15 days, the Government will accept title to those items and remove them or enter into a storage agreement. The Contracting Officer may verify the list upon removal of the items, or if stored, within 45 days from submission of the list, and shall correct the list, as necessary, before final settlement.

(d) After termination, the Contractor shall submit a final termination settlement proposal to the Contracting Officer in the form and with the certification prescribed by the Contracting Officer. The Contractor shall submit the proposal promptly, but no later than 1 year from the effective date of termination, unless extended in writing by the Contracting Officer upon written request of the Contractor within this 1-year period. However, if the Contracting Officer determines that the facts justify it, a termination settlement proposal may be received and acted on after 1 year or any extension. If the Contractor fails to submit the proposal within the time allowed, the Contracting Officer may determine, on the basis of information available, the amount, if any, due the Contractor because of the termination and shall pay the amount determined.

(e) Subject to paragraph (d) above, the Contractor and the Contracting Officer may agree upon the whole or any part of the amount to be paid because of the termination. The amount may include a reasonable allowance for profit on work done. However, the agreed amount, whether under this paragraph (e) or paragraph (f) below, exclusive of costs shown in subparagraph (f)(3) below, may not exceed the total contract price as reduced by (a) the amount of payments previously made and (2) the contract price of work not terminated. The contract shall be amended, and the Contractor paid the agreed amount.

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Paragraph (f) below shall not limit, restrict, or affect the amount that may be agreed upon to be paid under this paragraph.

(f) If the Contractor and the Contracting Officer fail to agree on the whole amount to be paid the Contractor because of the termination of work, the Contracting Officer shall pay the Contractor the amounts determined as follows, but without duplication of any amounts agreed upon under paragraph (e) above:

(1) For contract work performed before the effective date of termination, the total (without duplication of any items) of--

(i) The cost of this work;

(ii) The cost of settling and paying termination settlement proposals under terminated subcontracts that are properly chargeable to the terminated portion of the contract if not included in subdivision (i) above; and

(iii) A sum, as profit on (i) above, determined by the Contracting Officer under 49.202 of the Federal Acquisition Regulation, in effect on the date of this contract, to be fair and reasonable; however, if it appears that the Contractor would have sustained a loss on the entire contract had it been completed, the Contracting Officer shall allow no profit under this subdivision (iii) and shall reduce the settlement to reflect the indicated rate of loss.

(2) The reasonable costs of settlement of the work terminated, including--

(i) Accounting, legal, clerical, and other expenses reasonably necessary for the preparation of termination settlement proposals and supporting data;

(ii) The termination and settlement of subcontracts (excluding the amounts of such settlements); and

(iii) Storage, transportation, and other costs incurred, reasonably necessary for the preservation, protection, or disposition of the termination inventory.

(g) Except for normal spoilage, and except to the extent that the Government expressly assumed the risk of loss, the Contracting Officer shall exclude from the amounts payable to the Contractor under paragraph (f) above, the fair value, as determined by the Contracting Officer, of property that is destroyed, lost, stolen, or damaged so as to become undeliverable to the Government or to a buyer.

(h) The cost principles and procedures of Part 31 of the Federal Acquisition Regulation, in effect on the date of this contract, shall govern all costs claimed, agreed to, or determined under this clause.

(i) The Contractor shall have the right of appeal, under the Disputes clause, from any determination made by the Contracting Officer under paragraph (d), (f), or (k), except that if the Contractor failed to submit the termination settlement proposal within the time provided in paragraph (d) or (k), and failed to request a time extension, there is no right of appeal. If the Contracting Officer has made a determination of the amount due under paragraph (d), (f), or (k), the

Government shall pay the Contractor (1) the amount determined by the Contracting Officer if there is no right of appeal or if no timely appeal has been taken, or (2) the amount finally determined on an appeal.

(j) In arriving at the amount due the Contractor under this clause , there shall be deducted--

(1) All unliquidated advance or other payments to the contractor under the terminated portion of this contract;

(2) Any claim which the Government has against the Contractor under this contract; and

(3) The agreed price for, or the proceeds of sale of, materials, supplies, or other things acquired by the Contractor or sold under the provisions of this clause and not recovered by or credited to the Government.

ORIGINAL (Red)

(k) If the termination is partial, the Contractor may file proposal with the Contracting Officer for an equitable adjustment of the price(s) of the continued portion of the contract. The Contracting Officer shall make any equitable adjustment agreed upon. Any proposal by the Contractor for an equitable adjustment under this clause shall be requested within 90 days from the effective date of termination unless extended in writing by the Contracting Officer.

(l) (1) The Government may, under the terms and conditions it prescribes, make partial payments and payments against costs incurred by the Contractor for the terminated portion of the contract, if the Contracting Officer believes the total of these payments will not exceed the amount to which the Contractor will be entitled.

(2) If the total payments exceed the amount finally determined to be due, the Contractor shall repay the excess to the Government upon demand, together with interest computed at the rate established by the Secretary of the Treasury under 50 U.S.C. App. 1215-1(a)(2). Interest shall be computed for the period from the date the excess payment is received by the Contractor to the date the excess is repaid. Interest shall not be charged on any excess payment due to a reduction in the Contractor's termination settlement proposal because of retention or other disposition of termination inventory until 10 days after the date of the retention or disposition, or a later date determined by the Contracting Officer because of the circumstances.

(m) Unless otherwise provided in this contract or by statute, the Contractor shall maintain all records and documents relating to the terminated portion of this contract for 3 years after final settlement. This includes all books and other evidence bearing on the Contractor's costs and expenses under this contract. The Contractor shall make these records and documents available to the Government, at the Contractor's office, at all reasonable times, without any direct charge. If approved by the Contracting Officer, photographs, microphotographs, or other authentic reproductions may be maintained instead of original records and documents.

64. DEFAULT (FIXED-PRICE CONSTRUCTION) (1984 APR) FAR 52.249-10

(a) If the Contractor refuses or fails to prosecute the work or any separable part, with the diligence that will insure its completion within the time specified in this contract including any extension, or fails to complete the work within this time, the Government may, by written notice to the Contractor, terminate the right to proceed with the work (or the separable part of the work) that has been delayed. In

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this event, the Government may take over the work and complete it by contract or otherwise, and may take possession of and use any materials, appliances, and plant on the work site necessary for completing the work. The Contractor and its sureties shall be liable for any damage to the Government resulting from the Contractor's refusal or failure to complete the work within the specified time, whether or not the Contractor's right to proceed with the work is terminated. This liability includes any increased costs incurred by the Government in completing the work.

(b) The Contractor's right to proceed shall not be terminated nor the contractor charged with damages under this clause, if--

(1) The delay in completing the work arises from unforseeable causes beyond the control and without the fault or negligence of the Contractor. Examples of such causes include (i) acts of God or of the public enemy, (ii) acts of the Government in either its sovereign or contractual capacity, (iii) acts of another Contractor in the performance of a contract with the Government, (iv) fires, (v) floods, (vi) epidemics, (vii) quarantine restrictions, (viii) strikes, (ix) freight embargoes, (x) unusually severe weather, or (xi) delays of subcontractors or suppliers at any tier arising from unforseeable causes beyond the control and without the fault or negligence of both the Contractor and the subcontractors or suppliers; and

(2) The Contractor, within 10 days from the beginning of any delay (unless extended by the Contracting Officer), notifies the Contracting Officer in writing of the causes of delay. The Contracting Officer shall ascertain the facts and the extent of delay. If, in the judgment of the Contracting Officer, the findings of fact warrant such action, the time for completing the work shall be extended. The findings of the Contracting Officer shall be final and conclusive on the parties, but subject to appeal under the Disputes clause.

(c) If, after termination of the Contractor's right to proceed, it is determined that the Contractor was not in default, or that the delay was excusable, the rights and obligations of the parties will be the same as if the termination had been issued for the convenience of the Government.

(d) The rights and remedies of the Government in this clause are in addition to any other rights and remedies provided by law or under this contract.#

65. AUTHORIZED DEVIATIONS IN CLAUSES (1984 APR) FAR 52.252-6

(a) The use in this solicitation or contract of any Federal Acquisition Regulation (48 CFR Chapter 1) clause with an authorized deviation is indicated by the addition of "(DEVIATION)" after the date of the clause.#

66. COMPOSITION OF CONTRACTOR (JAN 1965) FAR SUPP 52.236-7000

If the Contractor hereunder is comprised of more than one legal entity, each such entity shall be jointly and severally liable hereunder.#

67. MODIFICATION OF PROPOSALS - PRICE BREAKDOWN (APR 1968) FAR SUPP 52.236-7001

The Contractor, in connection with any proposal he makes for a contract modification, shall furnish a price breakdown, itemized as required by the Contracting Officer. Unless otherwise directed, the

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breakdown shall be in sufficient detail to permit an analysis of all material, labor, equipment, subcontract, and overhead costs, as well as profit, and shall cover all work involved in the modification, whether such work was deleted, added or changed. Any amount claimed for subcontracts shall be supported by a similar price breakdown. In addition, if the proposal includes a time extension, a justification therefore shall also be furnished. The proposal, together with the price breakdown and time extension justification, shall be furnished by the date specified by the Contracting Officer.#

ORIGINAL (Red)

68. CERTIFICATION OF REQUESTS FOR ADJUSTMENT OR RELIEF EXCEEDING $100,000 (FEB 1980) FAR SUPP 52.233-7000

(The following clause is applicable if this contract is expected to exceed $100,000 and the procurement instrument identification number is prefixed by the letters "DACA.")

(a) Any contract claim, request for equitable adjustment to contract terms, request for relief under Public Law 85-804, or other similar request exceeding $100,000 shall bear, at the time of submission, the following certification given by a senior company official in charge at the plant or location involved:

> I certify that the claim is made in good faith, that the supporting data are accurate and complete to the best of my knowledge and belief; and that the amount requested accurately reflects the contract adjustment for which the Contractor believes the Government is liable.
>
> _____
> (Official's Name)
>
> _____
> (Title)

(b) The certification in paragraph (a) requires full disclosure of all relevant facts, including cost and pricing data.

(c) The certification requirement in paragraph (a) does not apply to:

(1) requests for routine contract payments; for example, those for payment for accepted supplies and services, routine vouchers under cost-reimbursement type contracts, and progress payment invoices; and

(2) final adjustments under incentive provisions of contracts.

(d) In those situations where no claim certification for the purposes of Section 813 has been submitted prior to the inception of a contract dispute, a single certification, using the language prescribed by the Contract Disputes Act but signed by a senior company official in charge at the plant or location involved, will be deemed to comply with both statutes.#

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69. ENVIRONMENTAL LITIGATION (1974 NOV OCE)

(a) If the performance of all or any part of the work is suspended, delayed, or interrupted due to an order of a court of competent jurisdiction as a result of environmental litigation, as defined below, the Contracting Officer, at the request of the Contractor, shall determine whether the order is due in any part to the acts or omissions of the Contractor or a Subcontractor at any tier not required by the terms of this contract. If it is determined that the order is not due in any part to acts or omissions of the Contractor or a Subcontractor at any tier other than as required by the terms of this contract, such suspension, delay, or interruption shall be considered as if ordered by the Contracting Officer in the administration of this contract under the terms of the "Suspension of Work" clause of this contract. The period of such suspension, delay or interruption shall be considered unreasonable, and an adjustment shall be made for any increase in the cost of performance of this contract (excluding profit) as provided in that clause, subject to all the provisions thereof.

(b) The term "environmental litigation", as used herein, means a lawsuit alleging that the work will have an adverse effect on the environment or that the Government has not duly considered, either substantively or procedurally, the effect of the work on the environment.

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SOLICITATION, OFFER, AND AWARD (Construction, Alteration, or Repair)	1. SOLICITATION NO.	2. TYPE OF SOLICITATION	3. DATE ISSUED	PAGE OF PAGES
	DACW45-85-B-0001	[X] ADVERTISED (IFB) [ ] NEGOTIATED (RFP)	84 Dec 15	SF-1 of SF-8

IMPORTANT – The "offer" section on the reverse must be fully completed by offeror.

4. CONTRACT NO.	5. REQUISITION/PURCHASE REQUEST NO.	6. PROJECT NO.

7. ISSUED BY	CODE	8. ADDRESS OFFER TO
U. S. Army Engineer District, Omaha 6014 U. S. Post Office and Courthouse 215 North 17th Street Omaha, Nebraska 68102		Superintendent of Public Facilities County of Roanoke [illegible]38 Brambleton Ave, SW, Rm 60[illegible] [illegible]anoke, VA [illegible]018

ORIGINAL (Red)

9. FOR INFORMATION CALL	A. NAME	B. TELEPHONE NO. (Include area code) (NO COLLECT CALLS)
	See BIDDING INFORMATION	SEE BIDDING INFORMATION

SOLICITATION

NOTE: In advertised solicitations "offer" and "offeror" mean "bid" and "bidder".

10. THE GOVERNMENT REQUIRES PERFORMANCE OF THE WORK DESCRIBED IN THESE DOCUMENTS (Title, identifying no., date)

The bidder hereby proposes to do all the work described in these documents entitled:

[illegible] LINE,
[illegible] SITE
[illegible] COUNTY, VIRGINIA

NOTE: FOR PURPOSES OF THIS SOLICITATION, THE TERM "SPECIAL PROVISIONS" SHALL BE CONSTRUED TO MEAN "SPECIAL CLAUSES".

11. The Contractor shall begin performance within 10 calendar days and complete it within 270 calendar days after receiving [ ] award [X] notice to proceed. This performance period is [X] mandatory [ ] negotiable (See ________.)

12A. THE CONTRACTOR MUST FURNISH ANY REQUIRED PERFORMANCE AND PAYMENT BONDS? (If "YES," indicate within how many calendar days after award in Item 12B.)	12B. CALENDAR DAYS
[X] YES [ ] NO	10

13. ADDITIONAL SOLICITATION REQUIREMENTS

A. Sealed offers [illegible] copy to perform the work required are due at the place specified in Item 8 by [illegible] (hour) local time [illegible] (date). If this is an advertised solicitation, offers will be publicly opened at that time. Sealed envelopes containing offers shall be marked to show the offeror's name and address, the solicitation number, and the date and time offers are due.

B. An offer guarantee is required.

C. All offers are subject to the (1) work requirements, and (2) other provisions and clauses incorporated in the solicitation in full text or by reference.

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D. Offers providing less than [illegible] calendar days for Government acceptance after the date offers are due will be considered nonresponsive and will be rejected.

OFFER (Must be fully completed by offeror)

14. NAME AND ADDRESS OF OFFEROR (Include ZIP Code)	15. TELEPHONE NO. (Include area code)
	16. REMITTANCE ADDRESS (Include only if different than Item 14)
DUNS Number:	
CODE FACILITY CODE	

17. The offeror agrees to perform the work required at the prices specified below in strict accordance with the terms of this solicitation, if this offer is accepted by the Government within _____ calender days after the date offers are due. (Insert any number equal to or greater than the minimum requirement stated in Item 13D. Failure to insert any number means the offeror accepts the minimum in Item 13D.)

AMOUNTS ▶ Entire work, complete $_____ (in figures)

Note: The above figure includes a connection fee of $52,666.35 to be paid to the city of Salem, VA. for construction of structures and appurtenances at the water line connection point.

18. The offeror agrees (a) to carry out this offer if the Government accepts it by signing Item 31B within the time specified in Item 13D, and (b) to furnish any required performance and payment bonds.

19. ACKNOWLEDGMENT OF AMENDMENTS

(The offeror acknowledges receipt of amendments to the solicitation — give number and date of each)

AMENDMENT NO.										
DATE										

20A. NAME AND TITLE OF PERSON AUTHORIZED TO SIGN OFFER (Type or print)	20B. SIGNATURE	20C. OFFER DATE

AWARD (To be completed by Government)

21. ITEMS ACCEPTED:

22. AMOUNT	23. ACCOUNTING AND APPROPRIATION DATA

24. SUBMIT INVOICES TO ADDRESS SHOWN IN (4 copies unless otherwise specified) ▶	ITEM 26	25. NEGOTIATED PURSUANT TO ☐ 10 USC 2304(a)( ) ☐ 41 USC 252(c)( )

26. ADMINISTERED BY CODE	27. PAYMENT WILL BE MADE BY
Commander U.S. Army Engineer District, Omaha ATTN: U.S. Post Office and Courthouse 215 North 17th Street Omaha, Nebraska 68102	Finance and Accounting Branch USAED Omaha P.O. Box 547 DTS Omaha, Nebraska 68101

CONTRACTING OFFICER WILL COMPLETE ITEM 28 OR 29 AS APPLICABLE

☐ 28 NEGOTIATED AGREEMENT (Contractor is required to sign this document and return _____ copies to issuing office.) Contractor agrees to furnish and deliver all items or perform all work, requisitions identified on this form and any continuation sheets for the consideration stated in this contract. The rights and obligations of the parties to this contract shall be governed by (a) this contract award, (b) the solicitation, and (c) the clauses, representations, certifications, and specifications or incorporated by reference in or attached to this contract.

☐ 29 AWARD (Contractor is not required to sign this document.) Your offer on this solicitation, is hereby accepted as to the items listed. This award consummates the contract, which consists of (a) the Government solicitation and your offer, and (b) this contract award. No further contractual document is necessary.

30A. NAME AND TITLE OF CONTRACTOR OR PERSON AUTHORIZED TO SIGN (Type or print)	31A. NAME OF CONTRACTING OFFICER (Type or print)

30B. SIGNATURE	30C. DATE	31B. UNITED STATES OF AMERICA BY	31C. AWARD DATE

STANDARD FORM 1442 BACK (10-83)

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CERTIFICATION AND REPRESENTATIONS

The bidder (offeror) makes the following certification and representations as a part of the bid, shall check the appropriate boxes on attached "Solicitation Form" (SF) pages, and submit with Standard Form 1442.

1. SMALL BUSINESS CONCERN REPRESENTATION (APRIL 1984). The offeror represents and certifies as part of its offer that it [ ] is [ ] is not a small business concern and that [ ] all [ ] not all supplies to be furnished will be manufactured or produced by a small business concern in the United States, its possessions, or Puerto Rico. "Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the size standards in this solicitation. (FAR 52.219-1.)

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2. SMALL DISADVANTAGED BUSINESS CONCERN REPRESENTATION (APRIL 1984).

2.1 REPRESENTATION. The offeror represents that it [ ] is [ ] is not a small disadvantaged business concern.

2.2 DEFINITIONS.

"Asian-Indian American," as used in this provision, means a United States citizen whose origins are in India, Pakistan, or Bangladesh.

"Asian-Pacific American," as used in this provision, means a United States citizen whose origins are in Japan, China, the Philippines, Vietnam, Korea, Samoa, Guam, the U.S. Trust Territory of the Pacific Islands, the Northern Mariana Islands, Laos, Cambodia, or Taiwan.

"Native Americans," as used in this provision, means American Indians, Eskimos, Aleuts, and native Hawaiians.

"Small business concerns," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

"Small disadvantaged business concern," as used in this provision, means a small business concern that (1) is at least 51 percent owned by one or more individuals who are both socially and economically disadvantaged, or a publicly-owned business having at least 51 percent of its stock owned by one or more socially and economically disadvantaged individuals, and (2) has its management and daily business controlled by one or more such individuals.

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CERTIFICATION AND REPRESENTATIONS

2.3 QUALIFIED GROUPS. The offeror shall presume that socially and economically disadvantaged individuals include Black Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans, and other individuals found to be qualified by the SBA under 13 CFR 124.1. (FAR 52.219-2.)

3. CONTINGENT FEE REPRESENTATION AND AGREEMENT (APRIL 1984).

3.1 REPRESENTATION. The offeror represents that, except for full-time bona fide employees working solely for the offeror, the offeror --

(1) [ ] has [ ] has not employed or retained any person or company to solicit or obtain this contract; and

(2) [ ] has [ ] has not paid or agreed to pay to any person or company employed or retained to solicit or obtain this contract any commission, percentage, brokerage, or other fee contingent upon or resulting from the award of this contract.

3.2 AGREEMENT. The offeror agrees to provide information relating to the above Representation as requested by the Contracting Officer and, when subparagraph 3.1(1) or 3.1(2) is answered affirmatively, to promptly submit to the Contracting Officer --

(1) A completed Standard Form 119, Statement of Contingent or Other Fees, (SF 119); or

(2) A signed statement indicating that the SF 119 was previously submitted to the same contracting office, including the date and applicable solicitation or contract number, and representing that the prior SF 119 applies to this offer or quotation. (FAR 52.203-4.)

4. TYPE OF BUSINESS ORGANIZATION - FORMAL ADVERTISING (APRIL 1984). The bidder, by checking the applicable box, represents that it operates as [ ] a corporation incorporated under the laws of the State of _____, [ ] an individual, [ ] a partnership, [ ] a nonprofit organization, or [ ] a joint venture. (FAR 52.214-2.)

5. CERTIFICATE OF INDEPENDENT PRICE DETERMINATION (APRIL 1984).

5.1 The offeror certifies that --

(1) The prices in this offer have been arrived at independently, without, for the purpose of restricting competition, any consultation, communication, or agreement with any other offeror or competitor relating to (i) those prices, (ii) the intention to submit an offer, or (iii) the methods or factors used to calculate the prices offered;

(2) the prices in this offer have not been and will not be knowingly disclosed by the offeror, directly or indirectly, to any other offeror or competitor before bid opening (in the case of a formally advertised solicitation) or contract award (in the case of a negotiated solicitation) unless otherwise required by law; and

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(3) no attempt has been made or will be made by the offeror to induce any other concern to submit or not to submit an offer for the purpose of restricting competition.

5.2 Each signature on the offer is considered to be a certification by the signatory that the signatory --

(1) is the person in the offeror's organization responsible for determining the prices being offered in this bid or proposal, and that the signatory has not participated and will not participate in any action contrary to subparagraphs 5.1(1) through 5.1(3) above; or

(2)(i) has been authorized, in writing, to act as agent for the following principals in certifying that those principals have not participated, and will not participate in any action contrary to subparagraphs 5.1(1) through 5.1(3) above _____

_____ [insert full name of person(s) in the offeror's organization responsible for determining the prices offered in this bid or proposal, and the title of his or her position in the offeror's organization];

(ii) as an authorized agent, does certify that the principals named in subdivision 5.2(2)(i) above have not participated, and will not participate, in any action contrary to subparagraphs 5.1(1) through 5.1(3) above; and

(iii) as an agent, has not personally participated, and will not participate, in any action contrary to subparagraphs 5.1(1) through 5.1(3) above.

5.3 If the offeror deletes or modifies subparagraph 5.1(2) above, the offeror must furnish with its offer a signed statement setting forth in detail the circumstances of the disclosure. (FAR 52.203-2.)

6. PARENT COMPANY AND IDENTIFYING DATA (APRIL 1984).

6.1 A "parent" company, for the purpose of this provision, is one that owns or controls the activities and basic business policies of the bidder. To own the bidding company means that the parent company must own more than 50 percent of the voting rights in that company. A company may control a bidder as a parent even though not meeting the requirement for such

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ownership if the parent company is able to formulate, determine, or veto basic policy decisions of the offeror through the use of dominant minority voting rights, use of proxy voting, or otherwise.

6.2 The bidder [ ] is, [ ] is not **(check applicable box)** owned or controlled by a parent company.

6.3 If the bidder checked "is" in paragraph 6.2 above, it shall provide the following information:

Name and Main Office Address of Parent Company (Include Zip Code)	Parent Company's Employer's Identification Number

6.4 If the bidder checked "is not" in paragraph 6.2 above, it shall insert its own Employer's Identification Number on the following line: _____. (FAR 52.214-8.)

7. CERTIFICATION OF NONSEGREGATED FACILITIES (APRIL 1984).

7.1 "Segregated facilities," as used in this provision, means any waiting rooms, work areas, restrooms and washrooms, restaurants and other eating areas, time clocks, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, or national origin because of habit, local custom, or otherwise.

7.2 By the submission of this offer, the offeror certifies that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The offeror agrees that a breach of this certification is a violation of the Equal Opportunity clause in the contract.

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CERTIFICATION AND REPRESENTATIONS

7.3 The offeror further agrees that (except where it has obtained identical certifications from proposed subcontractors for specific time periods) it will --

(1) obtain identical certifications from proposed subcontractors before the award of subcontracts under which the subcontractor will be subject to the Equal Opportunity clause;

(2) retain the certifications in the files; and

(3) forward the following notice to the proposed subcontractors (except if the proposed subcontractors have submitted identical certifications for specific time periods):

NOTICE TO PROSPECTIVE SUBCONTRACTORS OF REQUIREMENT FOR CERTIFICATIONS OF NONSEGREGATED FACILITIES.

A Certification of Nonsegregated Facilities must be submitted before the award of a subcontract under which the subcontractor will be subject to the Equal Opportunity clause. The certification may be submitted either for each subcontract or for all subcontracts during a period (i.e., quarterly, semi-annually, or annually).

NOTE: The penalty for making false statements in offers is prescribed in 18 U.S.C. 1001. (FAR 52.222-21.)

8. CLEAN AIR AND WATER CERTIFICATION (APRIL 1984). The offeror certifies that:

8.1 Any facility to be used in the performance of this proposed contract [ ] is [ ] is not listed on the Environmental Protection Agency List of Violating Facilities;

8.2 The offeror will immediately notify the Contracting Officer, before award, of the receipt of any communication from the Administrator, or a designee, of the Environmental Protection Agency, indicating that any facility that the offeror proposes to use for the performance of the contract is under conideration to be listed on the EPA List of Violating Facilities; and

8.3 The offeror will include a certification substantially the same as this certification, including this paragraph 8.3, in every nonexempt subcontract. (FAR 52.223-1.)

9. AFFILIATED BIDDERS (APRIL 1984).

9.1 Business concerns are affiliates of each other when, either directly or indirectly, (1) one concern controls or has the power to control the other, or (2) a third party controls or has the power to control both.

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CERTIFICATION AND REPRESENTATIONS

9.2 Each bidder shall submit with its bid an affidavit stating that it has no affiliates, or containing the following information:

(1) The names and addresses of all affiliates of the bidder.

(2) The names and addresses of all persons and concerns exercising control or ownership of the bidder and any or all of its affiliates, and whether they exercise such control or ownership as common officers, directors, stockholders holding controlling interest, or otherwise. (FAR 52.214-17.)

10. WOMEN-OWNED SMALL BUSINESS REPRESENTATION (APRIL 1984).

10.1 REPRESENTATION. The offeror represents that it [ ] is [ ] is not a women-owned small business concern.

10.2 DEFINITIONS.

"Small business concern," as used in this provision, means a concern, including its affiliates, that is independently owned and operated, not dominant in the field of operation in which it is bidding on Government contracts, and qualified as a small business under the criteria and size standards in 13 CFR 121.

"Women-owned," as used in this provision, means a small business that is at least 51 percent owned by a woman or women who are U.S. citizens and who also control and operate the business. (FAR 52.219-3.)

11. DATA UNIVERSAL NUMBERING SYSTEM (DUNS) NUMBER REPORTING (DEC 1980). In the block with its name and address, the offeror should supply the Data Universal Numbering System (DUNS) Number applicable to that name and address. The DUNS Number should be preceded by "DUNS:." If the Offeror does not have a DUNS Number, it may obtain one from any DUN and Bradstreet branch office. No offeror should delay the submission of its offer pending receipt of its DUNS Number. (FAR 52.204-7004.)

12. PREVIOUS CONTRACTS AND COMPLIANCE REPORTS (APRIL 1984). The offeror represents that:

12.1 It [ ] has [ ] has not participated in a previous contract or subcontract subject either to the Equal Opportunity clause of this solicitation, the clause originally contained in Section 310 of Executive Order No. 10925, or the clause contained in Section 201 of Executive Order No. 11114.

12.2 It [ ] has [ ] has not, filed all required compliance reports.

12.3 Representations indicating submission of required compliance reports, signed by proposed subcontractors, will be obtained before subcontract awards. (FAR 52.222-22.)

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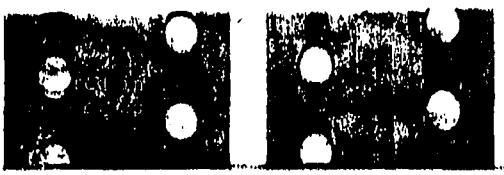

U. S. DEPARTMENT OF LABOR
EMPLOYMENT STANDARDS ADMINISTRATION

REQUEST FOR DETERMINATION AND RESPONSE TO REQUEST *(Davis Bacon Act as Amended and Related Statutes)*

FOR DEPARTMENT OF LABOR USE

Response To Request

a. ☐ *Use wage determination* issued for this area

b. ☐ The attached decision noted below is applicable to this project

Decision Number: 84-VA-592

Date of Decision: 7/15/84

Expires: 1/10/85

Supersedes Decision Number

Approved

Raymond K. Kamrath

Chief, Branch of Construction Contract Wage Determinations

Requesting Officer (typed name and signature)

J. M. HAUGH, District Labor Advisor

Department, Agency, or Bureau	Phone Number
ARMY-Omaha District	FTS 864-4065 402-221-4065

Date of Request	Est. Advertising Date	Est. Bid Opening Date
06-15-84	07-19-84	08-22-84

Prior Decision Number (if any)	Est. $ Value of Contract	Type of Work
83-VA-600	☐ Under ½ Mil. ☒ ½ to 5 Mil. ☐ Over 5 Mil.	☐ Bldg. ☐ Highway ☐ Resid. ☒ Heavy

Location of Project (city or other description)

Salem

County	State
Roanoke	Virginia

Address to which wage determination should be mailed. Must be complete and include ZIP Code. (Print or type)

Commander
U.S. Army Engineer District, Omaha
ATTN: ANDOOC
6014 U.S. Post Office & Courthouse
215 North 17th Street
Omaha, NE 68102

RECEIVED 30 JUL 1984 OFFICE OF COUNTY ENGR. ROANOKE, VIRGINIA

Wage Survey by Agency Attached	Wage Survey by Agency in Progress
☐ YES ☐ NO	☐ YES ☐ NO

Description of Work (Be specific) (Print or type)

Install 500 LF 6", 1400 LF 8", 2500 LF 10", 7600 LF 12", 6300 LF 16" water mains with related valves and fittings. 500,00 gal. storage tank; booster station with pump. (EPA Superfund

CHECK OR LIST CRAFTS NEEDED (Attach continuation sheet if needed)

- ___ Asbestos workers
- ___ Boilermakers
- ___ Bricklayers
- X Carpenters
- X Cement masons
- X Electricians
- ___ Glaziers
- X Ironworkers
- X Laborers, *(specify classes)*
  - ___ General
  - ___ Power Tool Oper.
  - ___ Mason Tender
  - ___
  - ___
- ___ Lathers
- ___ Marble & tile setters, terrazzo workers
- ___ Painters
- ___ Piledrivermen
- X Plasterers
- ___ Plumbers
- ___ Roofers
- ___ Sheet metal workers
- ___ Soft floor layers
- ___ Steamfitters
- X Welders--rate for craft
- X Truck drivers
- X Power equipment operators, *(specify types)*
  - ___ Trencher
  - ___ Grader
  - ___ Tractor w/Attach
  - ___ Cranes

Other crafts

___

___

308-103 (THIS REPLACES FORMS DB-11 & DB-11a) STANDARD FORM 308 JUNE 1972 U.S. DEPARTMENT OF LABOR

84-VA-592

HEAVY CONSTRUCTION and SEWER & WATER CONSTRUCTION	Basic Hourly Rates	Fringe Benefits
Carpenters	$ 6.57	
Electricians	8.06	
LINE CONSTRUCTION:		
Linemen	14.72	$.85 + 8%
Groundmen	8.33	$.85 + 8%
Laborers:		
Unskilled	4.45	
Pipelayers	5.27	
Plumbers	6.23	
Truck Drivers	4.79	
Well Drillers	5.00	
Well Drillers Helpers	3.75	
Power Equipment Operators		
Backhoe	7.10	
Crane	10.85	
Loader	6.14	
Paver	6.97	
Roller	6.35	

Welders: Receive rate prescribed for craft performing operation to which welding is incidental.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29 CFR. 5.5 (a)(1)(ii)).

Basic Hourly Rates	Fringe Benefits

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Serial No. DACW45-85-B-0001

ZERO ACCIDENTS

SPECIFICATIONS FOR
EXTENSION OF MUNICIPAL WATER SUPPLY LINE
MATTHEWS ELECTROPLATING SUPERFUND SITE,

ROANOKE COUNTY, VIRGINIA

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ZERO ACCIDENTS

SECTION 1A
SPECIAL CLAUSES

INDEX

Attachments:
Project Sign Std. Details
Submittal Register
Submittal Form
Construction Quality Daily Report Form

1. COMMENCEMENT, PROSECUTION, AND COMPLETION OF WORK. The Contractor shall commence work under this contract within ten (10) calendar days after the date of receipt by him of notice to proceed, prosecute said work diligently, and complete the entire work (except seeding) ready for use not later than 270 calendar days after receipt of Notice to Proceed. The time stated for completion shall include final cleanup of the premises.

2. LIQUIDATED DAMAGES. In case of failure on the part of the Contractor to complete the work within the time fixed in the contract or any extensions thereof, the Contractor shall pay to the Government as liquidated damages, pursuant to the General Provisions paragraph entitled "Termination for Default - Time Extensions," the sum of $150 for each day of delay.

2.1 EXCEPTION TO COMPLETION AND LIQUIDATED DAMAGES SCHEDULES. In case the Contracting Officer determines that seed-

ing, sodding, and/or planting and/or the specified maintenance thereof is not feasible during the construction period, such work will be excepted from the completion schedule and liquidated damages schedule and shall be accomplished during the first seeding, sodding, and/or planting period and the specified maintenance period following the completion date.

3. CONTRACT DRAWINGS AND SPECIFICATIONS.

3.1. SETS FURNISHED. Ten (10) sets of contract drawings (3 sets of full size and 7 sets of half-size) and specifications (except applicable publications incorporated into the Technical Provisions by reference) will be furnished the Contractor without charge. Additional sets will be furnished on request at the cost of reproduction. The work shall conform to the contract drawings, set out in the drawing index, all of which form a part of these specifications. The work shall also conform to the standard details bound or referenced herein.

3.2 NOTIFICATION OF DISCREPANCIES. The Contractor shall check all drawings furnished him immediately upon their receipt and shall promptly notify the Contracting Officer of any discrepancies. Dimensions marked on drawings shall be followed in lieu of scale measurements. Enlarged plans and details shall govern where the same work is shown at smaller scales. The Contractor shall compare all drawings and verify the figures before laying out the work and shall be responsible for any errors which might have been avoided thereby.

4. SUBMITTALS.

4.1 SUBMITTAL REGISTER. (ENG Form 4288.) Within 10 days after receipt of Notice to Proceed, the Contractor shall complete and submit to the Contracting Officer, for approval, six copies of the attached ENG Form 4288 SUBMITTAL REGISTER. A minimum of one form shall be assigned to each specification section on which shall be listed each item of equipment and material of each type for which fabricator's drawings and/or related descriptive data, test reports, samples, spare parts lists, O&M Manuals, or other types of submittals are required by the specifications. ENG Forms 4288 will be furnished to the Contractor by the Contracting Officer.

4.1.1 COLUMNS TO BE COMPLETED BY CONTRACTOR. Columns 3 and 4 and 6 through 9 of the register shall be fully completed for each submittal item to show the data called for thereon. Columns 1, 2 and 5 shall be left blank. Column 1 shall be used later for recording the respective submittal identification number inserted on each Submittal Form. Column 2 may be used for

an additional control number which shall be coordinated with the Contracting Officer's representative.

4.1.2 Order of Listing of Submittals. The order of listing of items on the register shall be by categories (Category I or II) and shall conform to the chronological sequence of each item as they occur in the contract specification sections.

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4.1.3 Scheduling. Drawings on component items forming a system or that are interrelated shall be scheduled to be correlated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (a minimum of 20 calendar days) shall be allowed on the register for review and approval and possible resubmittal of any items subject to approval, because no delay damages or time extensions will be allowed for time lost in late submittals or resubmittals for such items.

4.1.4 Review of Register. The Contracting Officer will review the Submittal Register for approval action. The column designated "Tech Review" will also be completed by the Contracting Officer to establish the correct addresses set forth below for direct mailing of submittals by the Contractor. A copy of the Submittal Register, so marked in the Tech Review column will be promptly returned to the Contractor.

4.1.5 Application to Contract. The approved register shall become a part of the contract and Contractor will be subject to requirements thereof. The Contractor shall revise and/or update the register monthly to take into account all changes in the contract. Each such revised addition and/or revision to the register shall be resubmitted to the Contracting Officer for approval. This register and the progress schedules shall be coordinated.

4.2 SUBMITTAL PROCESS. The Contractor shall submit all items listed on the contract drawings and listed or specified in other sections of these specifications. The Contracting Officer may request submittals in addition to those listed when deemed necessary to adequately describe the work covered in the respective sections. Submittals shall be made in the respective number of copies and to the respective addresses set forth below. Each submittal shall be complete and in sufficient detail for ready determination of compliance with the contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (C.Q.C.) Engineer and each respective submittal form shall be stamped, initialed, and dated by the C.Q.C. Engineer certifying that the accompanying submittal complies with the contract requirements. Submittals shall include such items as: Contractor's, manufacturer's, or fabricator's

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drawings; descriptive literature including (but not limited to) catalogue cuts, diagrams, operation charts or curves; test reports; test cylinders; samples, O&M manuals including parts lists; certifications; warranties and other such required submittals. Submittals pertinent to materials and equipment which are subject to advance approval shall be scheduled and made prior to the acquisition or the delivery thereof.

4.2.1 Categories of Submittals. The categories of items specified to be submitted shall be submitted as follows:

4.2.1.1 Category I. All items listed as Category I submittals in the various sections shall be mailed directly to the addressee shown below as directed. For each submittal, a completed information copy of the attached "Submittal" form shall also be mailed to the Area Engineer and to the Construction Division of the Norfolk District.

Technical Reviewer	Abbreviations Used in Column 10 of Submittal Register
Area Engineer S.W. Virginia Office Norfolk Drawer Corps of Engineers Radford Army Ammunition Plant Radford, VA 24141	"ED"

Each required submittal which is in the form of a drawing shall be submitted as one (1) reproducible and one (1) print of the drawing. Drawing prints shall be either blue or black line permanent-type prints on a white background or blueprint. Reproducibles shall be Brownline Diazo or Sepia and shall be of such quality that prints made therefrom are sufficiently clear for microfilm copying. All catalog and descriptive data shall be submitted in seven (7) copies. Catalog cuts and other descriptive data which have more than one model, size, or type or which shows optional equipment shall be clearly marked to show the model, size, or type and all optional equipment which is proposed for approval. Submittals on component items forming a system or that are interrelated shall be submitted at one time as a single submittal in order to demonstrate that the items have been properly coordinated and will function as a unit.

4.2.1.2 Category II. Except as noted below, data for all items listed as Category II Submittals in the various sections shall be submitted in four (4) copies to the Area Engineer using the SUBMITTAL FORM. Items not to be submitted in quadruplicate, such as samples and test cylinders, shall be sub-

mitted to the Area Engineer accompanied by four (4) copies of the SUBMITTAL FORM.

4.2.2 Control of Submittals. The Contractor shall carefully control his procurement operations to assure that each individual submittal is made on or before the corresponding date scheduled on his approved "SUBMITTAL REGISTER."

4.2.3 Submittal Form. The "Submittal Form" attached to this Section shall be used for submitting both the Category I and Category II submittals, in strict accordance with the instructions on the reverse side thereof. This form shall be reproduced by the Contractor. (The instructions on the back need not be reproduced on the copies used by the Contractor in forwarding the submittals.) This form shall be properly completed by filling out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and sheet number of the contract drawings pertinent to the data submitted for each item. A separate Submittal Form (MRO 1644) shall be attached to each copy of the data being submitted.

4.2.4 Approval Action.

4.2.4.1 Category I. All Category I submittals are subject to advance approval. Upon completion of review of Category I submittals, the drawing reproducible and print and other pertinent data will be identified as having received approval by being so stamped and dated. The drawing print and five (5) sets of all catalog data and descriptive literature will be retained by the Contracting Officer and the drawing reproducible and two sets of catalog data and descriptive literature will be returned to the Contractor.

4.2.4.2 Category II. Submittals may be required for "Approval" or for "Information Only." Within the terms of General Provision Clause: Shop Drawings, Category II submittals "for approval" shall be considered to be "shop drawings" and Category II submittal "for information only" shall not be considered to be "shop drawings." Two copies of Category II submittals for approval will be returned to the Contractor except for samples, test cylinders, and O&M manuals for which two copies of the Submittal Form only will be returned to the Contractor. Submittals for "Information Only" will not be returned to the Contractor. No Corps of Engineers' approval action will be required prior to incorporating these items into the work. These Contractor approved submittals will be used to verify that material received and used in the job is the same as that described and approved, and will be used as record copies. Delegation of this approval authority to the Contractor Quality Control does

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not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications and will not prevent the Contracting Officer from requiring removal and replacement if nonconforming material is incorporated in the work, nor does it relieve the Contractor from the requirement to furnish samples for testing by the Government laboratory or check testing by the Government in those instances where the technical specifications so prescribe.

4.2.5 Meaning of Approvals. The approval of the submittals by the Contracting Officer or his authorized representative shall not be construed as a complete check, but will indicate only that the general method of construction and detailing is satisfactory. Approval will not relieve the Contractor of the responsibility for any error which may exist as the Contractor, under the Contractor Quality Control requirements of this contract, is responsible for the dimensions and design of adequate connections, details and satisfactory construction of all work. After submittals have been approved by the Contracting Officer or his authorized representative, no resubmittal for the purpose of substituting materials or equipment will be given consideration unless accompanied by an acceptable explanation as to why a substitution is necessary.

4.2.6 When Not Approved. The Contractor shall make all corrections required by the Contracting Officer or his authorized representative and promptly furnish a corrected submittal in the form and number of copies as specified for initial submittal. If the Contractor considers any correction indicated on the submittals to constitute a change to the contract, notice as required under General Provisions paragraph: Changes shall promptly be given to the Contracting Officer.

4.2.7 Withholding of Payment. Payment for materials incorporated into the work will not be made if required approvals have not been obtained.

4.3 CERTIFICATES OF COMPLIANCE. Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in three copies. Each certificate shall be signed by a corporate officer of the manufacturing company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date or dates of shipment or delivery to which the certificates apply.

4.4 PURCHASE ORDERS. Each purchase order issued by the Contractor or his subcontractors for materials and equipment to be incorporated into the project shall:

(i) be clearly identified with the applicable DA contract number;

(ii) carry an identifying number;
(iii) be in sufficient detail to identify the material being purchased;
(iv) indicate a definite delivery date, and
(v) display the DMS priority rating.
Copies of purchase orders shall be furnished to the Contracting Officer when the Contractor requests assistance for expediting deliveries of equipment or materials, or when requested by the Contracting Officer for the purpose of quality assurance review.

4.5 EQUIPMENT ROOM DRAWINGS. If the Contractor elects to install mechanical and/or electrical equipment of size, shape, or arrangement differing from those shown and specified in mechanical rooms with limited available space, he shall prepare and submit room plans for such mechanical rooms or similar areas.

4.5.1 Assembled Submittal. Submittals describing the various mechanical and electrical equipment items which are to be installed in the above described area(s) shall be assembled and submitted under Category I concurrently and accompanied by the room plans.

4.5.2 Scaled Details. Plans, consolidated for all trades, shall be to scale and shall show all pertinent structural features and other items such as doors, windows, and cabinets required for installation and which will affect the available space. All mechanical and electrical equipment and accessories shall be shown to scale in plan and elevation and/or section in their installed positions. All duct work and piping shall be shown.

4.6 OPERATION AND MAINTENANCE MANUALS AND PARTS LISTS.

4.6.1 Operations and Maintenance Instruction Manuals. Where required by various technical sections, Operations and Maintenance instructions manuals shall be provided by the Contractor in quadruplicate, unless otherwise specified, and shall be assembled in book form having a cover indicating the contents by equipment or system name and project title and shall be submitted to the Contracting Officer 30 days prior to final tests of mechanical and electrical systems.

4.6.2 Parts Lists. Where required by the various technical sections, parts lists indicating source and current unit prices shall be provided by the Contractor in quadruplicate with cover indicating the contents by equipment or system name and project title and shall be submitted with the related Operations and Maintenance Manuals.

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5. PHYSICAL DATA. Pursuant to General Provisions clause: Conditions Affecting the Work, and General Provisions clause: Site Investigation, information and data furnished or referred to below are furnished for general information only and the Government shall not be liable for any interpretation or conclusions drawn therefrom by the Contractor.

5.1 SOURCE OF DATA. The physical conditions indicated on the drawings and in the specifications are the results of investigations by site surveys.

5.2 WEATHER. Weather conditions shall have been investigated by the Contractor to satisfy himself as to the hazards likely to arise therefrom. Complete weather records and reports may be obtained from the local U.S. Weather Bureau.

5.3 ACCESS ROUTES. Transportation facilities shall have been investigated by the Contractor to satisfy himself as to the existence of access highways and railroad facilities.

6. PAYMENT FOR MATERIALS DELIVERED OFFSITE. In accordance with General Provision clause: Payments to Contractor, the Contracting Officer, at his discretion, may authorize material delivered to the Contractor at locations other than the site to be taken into consideration in the preparation of payment estimates. Such materials delivered to the Contractor offsite will only be considered if the Contractor furnishes satisfactory evidence that he has acquired title to such material and that it will be utilized in the work covered under this contract.

7. AVAILABILITY OF UTILITY SERVICES. The Contractor shall arrange with the local utility company for electricity required by him for construction under this project and shall pay all costs in connection therewith, and shall also arrange for his own water supplies from public water sources. The Contractor shall meter the amount of water used by him, and such amount of water will be paid for by the Contractor. The Contractor shall, at his own expense, make all temporary connections and install distribution lines. All temporary lines shall be maintained by the Contractor in a workmanlike manner satisfactory to the Contracting Officer and shall be removed by the Contractor in like manner prior to final acceptance of the construction. Normal quantities of electricity and water used to make final tests of completely installed systems shall be furnished by the Contractor, at his own expense.

8. UTILITY SERVICE INTERRUPTIONS. The Contractor shall submit written notification not less than 5 days in advance of each planned interruption of each utility service to or within existing buildings and facilities being used by others. No single

outage shall exceed 4 hours unless previously approved in writing. The time and duration of all outages will be coordinated with the Using Agency by the Contracting Officer.

9. LAYOUT OF WORK. The Contractor shall lay out his work from Government established dimensions, base lines and bench marks indicated on the drawings, and shall make all measurements in connection therewith. The Contractor shall furnish all stakes, templates, platforms, equipment, tools, and materials and labor as may be required in laying out any part of the work from the dimensions, base lines and marks established by the Government. The Contractor shall execute the work to the lines and grades established or indicated and shall maintain and preserve all stakes and other control points established by the Contracting Officer until authorized to remove them. If such marks are destroyed by or through negligence of the Contractor, prior to their authorized removal, they may be replaced by the Contracting Officer at his discretion and the expense of replacement will be deducted from any amounts due or to become due the Contractor.

10. TIME EXTENSIONS. Notwithstanding any other provisions of this contract, the time extensions for changes in the work will depend upon the extent, if any, by which the changes cause delay in the completion of the various elements of construction. The change order granting the time extension may provide that the contract completion date will be extended only for those specific elements so delayed and that the remaining contract completion dates for all other portions of the work will not be altered and may further provide for an equitable readjustment of liquidated damages pursuant to the new completion schedule.

11. INSURANCE REQUIRED.

11.1 The Contractor shall procure and maintain during the entire period of his performance under this contract the following minimum insurance:

Type	Amount
Workmen's Compensation and Employer's Liability Insurance	$100,000
General Liability Insurance	$300,000 per occurrence
Automobile Liability Insurance	
Bodily injury	$100,000 per person and $300,000 per occurrence
Property damage	$ 10,000 per occurrence

11.2 Prior to the commencement of work hereunder, the Contractor shall furnish to the Contracting Officer a certificate or written statement of the above required insurance. The policies evidencing required insurance shall contain an endorsement to the effect that cancellation or any material change in the policies adversely affecting the interest of the Government in such instances shall not be effective for such period as may be prescribed by the laws of the State in which this contract is to be performed and in no event less than thirty (30) days after written notice thereof to the Contracting Officer.

11.3 The Contractor agrees to insert the substance of this clause in all subcontracts hereunder.

12. IDENTIFICATION OF EMPLOYEES. The Contractor shall furnish to each employee, and require each employee engaged on the work to display, such identification as may be approved and directed by the Contracting Officer. All prescribed identification shall immediately be delivered to the Contracting Officer, for cancellation upon release of any employee. When required by the Contracting Officer, the Contractor shall obtain and submit fingerprints of all persons employed or to be employed on the project.

13. CONTRACTOR QUALITY CONTROL (COC). In conformance with the requirements of General Provisions clause: Contractor Inspection System, the Contractor shall provide and maintain an effective Quality Control Program.

13.1 GENERAL. Except for isolated tests or other items of work specified to be performed by the Government, the quality of all work shall be the responsibility of the Contractor. Sufficient inspections and tests of all items of work, including that of subcontractors, to ensure conformance to applicable specifications and drawings with respect to the quality of materials, workmanship, construction, finish, functional performance, and identification shall be performed on a continuing basis. The Contractor shall furnish qualified personnel and appropriate facilities, instruments and testing devices necessary for the performance of the quality control function. The controls shall be adequate to cover all construction operations, shall be keyed to the proposed construction sequence, and shall be correlated by the Contractor's quality control personnel.

13.2 PRE-CONSTRUCTION PLANNING. Within ten (10) calendar days after the date of receipt by him of notice to proceed, and prior to starting onsite construction, the Contractor shall meet with the Contracting Officer and discuss the quality control requirements. During this meeting the Contractor shall submit for

approval his proposed written QC plan which shall include all features outlined below. The proposed plan will be reviewed and the meeting shall develop mutual understanding relative to details of the system, including the personnel, facilities, forms, etc., to be used for the inspections, tests and the administration of the system. No change in the approved plan shall be implemented without written concurrence by the Contracting Officer.

13.3 CONTRACTOR'S PROPOSED QC PLAN. The Contractor's proposed written quality control plan (for submittal at the pre-construction meeting) shall include as a minimum:

13.3.1 The quality control organization.

13.3.2 Names, number, and qualification of personnel to be used for this purpose.

13.3.3 Authority and responsibilities of all quality control personnel.

ORIGINAL (Red)

13.3.4 Schedule of Use of inspection personnel by types and phase of work.

13.3.5 Proposed test methods, including names of technicians or qualified testing laboratory to be used.

13.3.6 Method of performing, documenting, and enforcing quality control operations of both prime and subcontract work including inspection and testing.

13.3.7 A copy of a letter of direction to the Contractor's representative responsible for quality control, outlining his duties and responsibilities, and signed by a responsible officer of the firm.

13.4 CONTROL OF ONSITE CONSTRUCTION. The Contractor's quality control program shall include four phases of inspection and tests. The Contracting Officer's representative shall be notified at least 24 hours in advance of each such test. The Contractor may at his option perform such other tests as he may elect, but such tests shall not be deemed part of this contract.

13.4.1 Preparatory Inspection shall be performed prior to beginning each feature of work on any onsite construction work. Preparatory inspections for the applicable feature of work shall include:

(i) review of submittal requirements and all other contract requirements with the foremen or supervisors directly responsible for the performance of the work;

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(ii) check to assure that provisions have been made to provide required field control testing;

(iii) examine the work area to ascertain that all preliminary work has been completed;

(iv) verify all field dimensions and advise the Contracting Officer of any discrepancies; and

(v) perform a physical examination of materials and equipment to assure that they conform to approved shop drawings or submittal data and that all materials and/or equipment are on hand.

13.4.2 Initial Inspection shall be performed as soon as work begins on a representative portion of the particular feature of work and shall include examination of the quality of workmanship as well as a review of control testing for compliance with contract requirements.

13.4.3 Follow-up Inspections shall be performed continuously as any particular feature of work progresses, to assure compliance with contract requirements including control testing, until completion of that feature of the work.

13.4.4 Safety Inspections. The Contractor shall perform daily safety inspections of the jobsite and the work in progress to assure compliance with EM 385-1-1 and other occupational health and safety requirements of the contract. Daily Quality Control reports as required under paragraph: Reporting shall be used to document the inspection and shall include a notation of the safety deficiencies observed and the corrective actions taken. The Contractor shall use his designated Quality Control Staff to perform the required inspections and shall supplement the staff with additional personnel as required. Additional personnel shall be provided at no additional cost to the Government.

13.5 QUALITY CONTROL STAFF. The Contractor's job supervisory staff may be used for quality control, supplemented as necessary by additional personnel including special technicians for surveillance or testing to provide capability for the controls required by the specifications. The Contractor's staff member designated as the Q.C. Supervisory Engineer for the contract shall be a qualified engineer or technician and shall be able to demonstrate his ability to perform correctly the duties required of him to the satisfaction of the Contracting Officer and must be employed full time at the project site whenever work is in progress.

13.6 TESTING LABORATORY AND EQUIPMENT. The Contractor shall provide either an onsite laboratory with testing apparatus and qualified laboratory technicians, or (at his option) employ an

approved laboratory or laboratories to perform all sampling and testing as specified. All measuring and testing devices, laboratory equipment, instruments, transportation, and supplies necessary to accomplish the required testing and inspection shall be calibrated at established intervals against certified standards. The testing laboratory organization shall be experienced in the type of testing work to be done. A representative of the testing laboratory shall be at the work site as necessary for sampling, inspecting and testing required to control the quality of the work. Upon request, certain measuring and testing devices shall be made available for use by the Government for verification tests.

13.7 REPORTING. All inspections and test results shall be recorded daily.

13.7.1 Daily Submittals. The attached sample "Quality Control Daily Report" form shall be reproduced and fully executed to show all inspections and tests and submitted to the Contracting Officer's representative on the first work day following the date covered by the report.

13.7.2 Results of Tests. Triplicate copies of complete results of tests shall be submitted not later than 3 calendar days after each test is performed.

13.8 ENFORCEMENT. The Contractor shall stop work on any item or feature, pending satisfactory correction of any deficiency noted by his quality control staff or by the Contracting Officer's representative. Construction shall not proceed upon any feature of work containing uncorrected work. Notations on quality control reports will not be acceptable as a substitution for other written reports by the Contractor if required under General Provisions clauses: Changes; Differing Site Conditions; or Termination for Default - Damages for Delay - Time Extensions.

13.9 PAYMENT. At the election of the Contracting Officer, no payment estimate will be processed under this contract until the entire Quality Control Plan has been approved or until overdue daily QC reports are properly executed and furnished.

14. PERFORMANCE OF WORK BY CONTRACTOR. The Contractor shall perform on the site, and with his own organization, work equivalent to at least forty percent (40%) of the total amount of work to be performed under the contract. If during the progress of the work hereunder, the Contractor requests a reduction in such percentage and the Contracting Officer determines that it would be to the Government's advantage, the percentage of the work required to be performed by the Contractor may be reduced,

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provided prior written approval of such reduction is obtained by the Contractor from the Contracting Officer.

15. NONDOMESTIC CONSTRUCTION MATERIALS. The requirements of this contract entitled Buy American Act do not apply to construction materials or their components included in the list set forth in paragraph 6-105 of the Armed Services Procurement Regulation.

16. CONTROLLED MATERIALS DATA. Forms DMS-4C will be mailed to the Contractor by this office within 5 days after date of receipt by him of notice to proceed. Within 15 calendar days after date of receipt by him of notice to proceed, the Contractor shall unless otherwise directed furnish the executed Forms DMS-4C showing quantities of all controlled materials to be required in the project construction during each calendar quarter as applicable. This information will be used by this office in the allotting of controlled materials and issuing a DO-C2 priority rating for procurement of critical materials by the Contractor.

17. PREFERENCE FOR DOMESTIC SPECIALTY METALS (1980).

17.1 The Contractor agrees that any specialty metals (as hereinafter defined) furnished by him or purchased by him for direct incorporation in any article delivered to the Government under this contract shall have been melted in the United States, its possessions, or Puerto Rico; provided, that this clause shall have no effect to the extent that:

(i) the Secretary or his designee determines that a satisfactory quality and sufficient quantity of such articles cannot be acquired as and when needed at U.S. market prices;

(ii) the acquisition is for a qualifying country end product; or

(iii) the acquisition is necessary to comply with agreements with foreign governments requiring the United States to purchase supplies from foreign sources for the purpose of offsetting sales made by the U.S. Government or U.S. firms under approved programs serving defense requirements.

17.2 For the purposes of this clause, the term "specialty metals" means:

17.2.1 Steels, where the maximum alloy content exceeds one or more of the following limits: manganese, 1.65 percent; silicon, 0.60 percent; or copper, 0.60 percent or which contains more than 0.25 percent of any of the following elements: aluminum, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, or vanadium.

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17.2.2 Metal alloys consisting of nickel, iron-nickel and cobalt base alloys containing a total of other alloying metals (except iron) in excess of ten percent (10%).

17.2.3 Titanium and titanium alloys.

17.2.4 Zirconium and zirconium base alloys. (DAR 7-104.93)

18. DAILY WORK SCHEDULES. In order to closely coordinate work under this contract, the Contractor shall prepare for and attend a weekly coordination meeting with the Contracting Officer and Using Service at which time the Contractor shall submit for coordination and approval, his proposed daily work schedule for the next two week period. Required temporary utility services, time and duration of interruptions, and protection of adjoining areas shall be included with the Contractor's proposed two week work schedule. Coordination action by the Contracting Officer relative to these schedules will be accomplished during these weekly meetings.

19. EQUIPMENT OWNERSHIP AND OPERATING EXPENSE SCHEDULE. (1982 JUN OCE.)

19.1 Whenever actual ownership and operating costs for each piece of equipment or equipment groups of similar serial numbers and series cannot be determined by the Contracting Officer from a Contractor's accounting records, allowable costs for construction equipment in sound workable condition owned or controlled and furnished by the Contractor or subcontractor at any tier for work requiring adjustments in contract price shall be determined in accordance with the applicable provisions of the "Construction Equipment Ownership and Operating Schedule," Region II. For forward pricing, the Schedule in effect at the time of negotiations shall apply. For retrospective pricing, the Schedule in effect as of the time work was performed shall apply. For the purpose of determination of the hourly rates to be applied under this contract, working conditions shall be considered to be average unless otherwise determined by the Contracting Officer. Rates for equipment not in the schedule will be computed by the Government using the formulas in the schedule. Where applicable, rates in the schedule may be used for unlisted equipment of comparable horsepower and auxillary features.

19.2 Equipment rental costs are allowable, subject to the provisions of DAR 15-205.34 and 15-402.2, substantiated by certified reproduced copies of invoices or bills. Rates for equipment rented from an organization under common control, lease-purchase or sale-leaseback arrangements will be determined in

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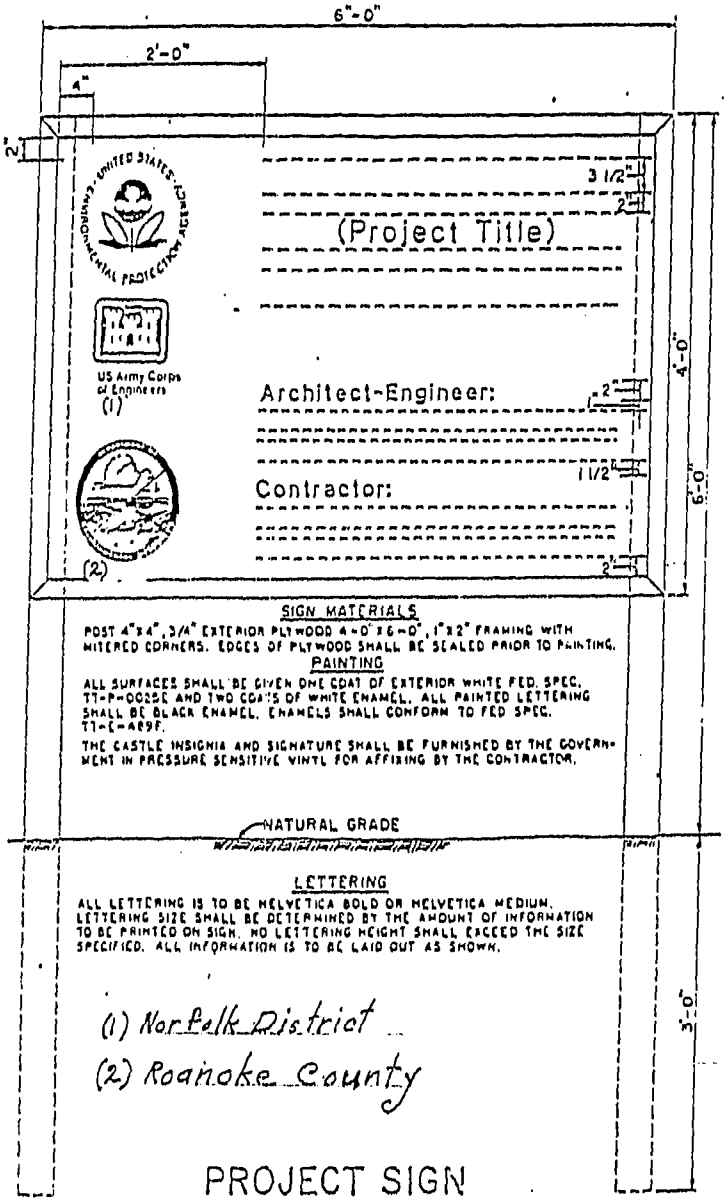
accordance with the schedule. A copy of the schedule will be provided to the successful bidder upon request.

20. AS-BUILT DRAWINGS. The Contractor shall maintain a separate set of full scale black and white contract drawings marked-up to fully indicate as-built conditions. These drawings shall be maintained in a current condition at all times until completion of the work and shall be available for review by Government personnel at all times. All variations from the contract drawings, for whatever reason, including those occasioned by optional materials and the required coordination between trades, shall be indicated. These variations shall be shown in the same general detail utilized in the initial contract drawings. The marked-up drawings shall be furnished to the Contracting Officer not later than ten (10) days after the work is completed.

21. SIGN. On commencement of work on this project, the Contractor shall furnish and erect the temporary sign in the location selected by the Contracting Officer near the project site. The Contractor shall maintain the sign in good condition through the project construction period and on completion of the project shall remove the sign from the premises. The project sign shall conform to the details of the Standard Drawing as bound herein. A decal of the "Engineer Castle" will be furnished the Contractor upon request.

22. ON-SITE AND OFF-SITE. The words "on-site," as used in these specifications, include all areas within the Contract Limits. The words "off- site" include all other areas.

23. ACCOMMODATIONS FOR GOVERNMENT INSPECTORS. The Contractor shall furnish a temporary office facility approximately 10 feet x 20 feet with a minimum of 200 square feet of floor space. It shall be located where directed and shall be reserved for Government personnel only. Drinking water facilities, adequate lighting, local commercial telephone service, air-conditioning, ventilation, heating equipment, and a partition-enlosed chemical toilet shall be furnished and maintained by the Contractor. The office shall be furnished with one drafting table with stool, one plan rack, one desk, and three chairs. Used furniture, in good condition, will be acceptable. Entrance doors shall be equipped with a substantial lock. Janitor service shall be furnished by the Contractor. The building shall be constructed so as to be easily moved and the Contractor shall relocate the building twice during the contract, if so directed. The entire facility, including furniture, will remain the property of the Contractor and shall be removed from the site after completion of the work.



SIGN MATERIALS

POST 4"x4", 3/4" EXTERIOR PLYWOOD 4'-0"x6'-0", 1"x2" FRAMING WITH MITERED CORNERS. EDGES OF PLYWOOD SHALL BE SEALED PRIOR TO PAINTING.

PAINTING

ALL SURFACES SHALL BE GIVEN ONE COAT OF EXTERIOR WHITE FED. SPEC. TT-P-0028E AND TWO COATS OF WHITE ENAMEL. ALL PAINTED LETTERING SHALL BE BLACK ENAMEL. ENAMELS SHALL CONFORM TO FED SPEC. TT-E-489F.

THE CASTLE INSIGNIA AND SIGNATURE SHALL BE FURNISHED BY THE GOVERNMENT IN PRESSURE SENSITIVE VINYL FOR AFFIXING BY THE CONTRACTOR.

LETTERING

ALL LETTERING IS TO BE HELVETICA BOLD OR HELVETICA MEDIUM. LETTERING SIZE SHALL BE DETERMINED BY THE AMOUNT OF INFORMATION TO BE PRINTED ON SIGN. NO LETTERING HEIGHT SHALL EXCEED THE SIZE SPECIFIED. ALL INFORMATION IS TO BE LAID OUT AS SHOWN.

(1) Norfolk District

(2) Roanoke County

PROJECT SIGN

000102

(ER 415-1-10)

SHOP DRAWINGS AND MATERIALS SUBMITTAL CONTROL FORM

SUBMITTAL REGISTER

TITLE AND LOCATION

CONTRACTOR

CONTRACT NUMBER

SUBMITTAL NUMBER 1	SHOP DRAWING NUMBER 2	SPECIFICATION PARAGRAPH NUMBER 3	TYPE OF SUBMITTAL 4	HAS ACTIVITY CODE 5	DESCRIPTION OF MATERIAL 6	CONTRACTOR SCHEDULED DATES: SUBMIT DATE 7	CONTRACTOR SCHEDULED DATES: APPROVAL NEEDED BY 8	CONTRACTOR SCHEDULED DATES: MATERIAL EQUIP NEEDED 9	ACTION ELEMENT: ITEM REVIEWED BY 10	CORPS ACTION DATES: SUBMITTED 11	CORPS ACTION DATES: APPROVED OR RETURNED 12	REMARKS 13

*AE - ARCHITECT ENGINEER ED - ENGINEERING DIVISION CD - CONSTRUCTION DIVISION AREA - AREA RESIDENT ENGINEER N A - APPROVAL NOT REQUIRED (FOR INFORMATION ONLY)

ENG FORM 4288 EDITION OF OCT 72 IS OBSOLETE ENGINEER

Page _____ of _____ Pages

EQT500

SUBMITTAL FORM DATE _____

TO _____ Submittal Ident. Number _____ (including category)

_____

Contract Number _____ New Submittal _____

Resubmittal _____ Previous Submittal Ident. Number _____

Project Title _____ Location _____

Spec Section Number _____ Contract Drawing Number _____

(1) Specs Para.	(2) Supplier Drawing Number	(3) Description of Material (per ENG 4288)	(4) Manufacturer	(5) Cys Subm	(6) Action Taken	(7) Cys Rtnd

I certify that I have reviewed in detail the data for the equipment and materials covered by this submittal and that they are in strict conformance with the contract drawings and specifications.

_____ (Quality Control Supervisor)

_____ (Contractor)

_____ (Mailing Address)

(THIS SPACE IS FOR CORPS OF ENGINEERS APPROVING AUTHORITY ONLY)

The above submittals are returned with action as designated above in accordance with the following legend:

A - Approved

B - Approved subject to corrections noted on submittal data and/or comments on reverse of this sheet

C - Not approved (see comments on reverse side of this sheet)

DATE _____

_____ (Signature of Approving Authority)

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MRO Form 1644, 1 Aug 82

INSTRUCTIONS FOR USE OF THIS FORM (MRO-1644)
(Not to be reproduced On Contractor's copies of this form)

All drawings, manufacturer's literature, and/or equipment data, samples and test results submitted, and other such submittals shall be accompanied by this form.

This form should be reproduced on thin, tough white paper.

The Special Clauses of the Contract specify the number of copies to be submitted.

Category I and Category II submittals shall each be numbered consecutively in the space titled "Submittal Ident. Number." The Category designation shall precede the number - for example, I-1. These numbers, along with the contract number, will identify each submittal. Resubmittals shall show the original number followed by letter "a", "b", "c", etc. as applicable. For example - if submittal I-12 requires a resubmittal, the resubmittal would be identified as I-12a and the space identified as "previous submittal ident. number" would be I-12, etc.

The Contractor shall complete columns (1) thru (5). Columns (6) and (7) will be completed by the reviewing authority.

Column (1) shall contain the specification paragraph the describes the material being submitted.

Column (2) shall contain the supplier's drawing number.

Column (3), Description of Material, shall match that of Column 6 on ENG 4288, Submittal Register.

Column (4) shall contain the manufacturer or supplier name, as applicable.

Under column (5) "Cys Subm", the number of copies submitted of each inclosure shall be shown.

A separate submittal form shall be used for each type of data submitted in accordance with each section of the specifications.

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CONSTRUCTION QUALITY CONTROL DAILY REPORT

_____
(CONTRACTOR)

REPORT NO. _____ CONTRACT NO. _____ DATE _____

LOCATION OF WORK: _____

DESCRIPTION: _____

WEATHER _____, RAINFALL _____ INCHES, TEMP.: MIN. _____ MAX. _____

1. Work Performed Today by Prime Contractor (Include Plant and Labor Breakdown): _____

2. Work Performed Today by Subcontractors (Include Plant and Labor Breakdown): _____

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3. List Specific Inspection Performed and Results of These Inspections. (Include Corrective Actions): _____

4. List Type and Location of Tests Performed and Results of These Tests:

5. Verbal Instructions Received from Government Personnel on Construction Deficiencies or Re-testing Required: _____

6. Safety Violations Observed and Actions Taken: _____

7. Remarks: _____

8. CERTIFICATION: I certify that the above report is complete and correct and that I, or my authorized representative, have inspected all work performed this day by the prime contractor and each subcontractor and have determined that all materials, equipment, and workmanship are in strict compliance with the plans and specifications except as may be noted above.

000107

_____
Contractor's Designated Quality Control Representative

ZERO ACCIDENTS

SECTION 1B
WARRANTY OF CONSTRUCTION

1. In addition to any other warranties set out elsewhere in this contract, the Contractor warrants that the work performed under this contract conforms to the contract requirements and is free of any defect of equipment, material or design furnished, or workmanship performed by the Contractor or any of his subcontractors or suppliers at any tier. Such warranty shall continue for a period of one year from the date of final acceptance of the work, but with respect to any part of the work which the Government takes possession of prior to final acceptance, such warranty shall continue for a period of one year from the date the Government takes possession. Under this warranty, the Contractor shall remedy at his own expense any such failure to conform or any such defect. In addition, the Contractor shall remedy at his own expense any damage to the Government owned or controlled real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements or any such defect of equipment, material, workmanship, or design. The Contractor shall also restore any work damaged in fulfilling the terms of this clause. The Contractor's warranty with respect to work repaired or replaced hereunder will run for one year from the date of such repair or replacement.

2. The Government shall notify the Contractor in writing within a reasonable time after the discovery of any failure, defect, or damage.

3. Should the Contractor fail to remedy any failure, defect, or damage described in 1 above within reasonable time after receipt of notice thereof, the Government shall have the right to replace, repair, or otherwise remedy such failure, defect, or damage at the Contractor's expense.

4. In addition to the other rights and remedies provided by this clause, all subcontractors', manufacturers' and suppliers' warranties expressed or implied, respecting any work and materials shall, at the direction of the Government, be enforced by the Contractor for the benefit of the Government. In such case if the Contractor's warranty under 1 above has expired, any suit directed by the Government to enforce a subcontractor's, manufacturer's or supplier's warranty shall be at the expense of the Government. The Contractor shall obtain any warranties which the subcontractors, manufacturers, or suppliers would give in normal commercial practice.

5. If directed by the Contracting Officer, the Contractor shall require any such warranties to be executed in writing to the Government.

6. Notwithstanding any other provision of this clause, unless such a defect is caused by the negligence of the Contractor or his subcontractors or suppliers at any tier, the Contractor shall not be liable for the repair of any defects of material or design furnished by the Government nor for the repair of any damage which results from any such defect in Government furnished material or design.

7. The warranty specified herein shall not limit the Government's rights under the Inspection and Acceptance clause of this contract with respect to latent defects, gross mistake, or fraud.

8. Defects in design or manufacture of equipment, specified by the Government on a "brand name and model" basis, shall not be included in this warranty. The Contractor shall require any subcontractors, manufacturers, or suppliers thereof to execute their warranties in writing directly to the Government.

ZERO ACCIDENTS

SECTION 1C
ENVIRONMENT PROTECTION

INDEX

1. GENERAL. The Contractor shall perform all work in such a manner as to minimize the polluting of air, water, or land, and shall, within reasonable limits, control noise and the disposal of solid waste materials, as well as other pollutants.

2. IMPLEMENTATION. Within 20 calendar days after Notice to Proceed and prior to commencement of work at the site, the Contractor shall:

2.1 Submit in writing his detailed proposal for implementing the requirements for environmental pollution control specified herein.

2.2 Meet with representatives of the Contracting Officer to review and alter his proposal as needed for compliance with the environmental pollution control program.

3. PRECONSTRUCTION SURVEY. Prior to start of any on-site construction activities, the Contractor and the Contracting Officer shall make a joint condition survey, after which the Contractor shall prepare a brief report indicating on a layout plan the condition of trees, shrubs and grassed areas immediately adjacent to the site of the work and adjacent to his assigned storage area and access route(s), as applicable. This report shall be signed by both the Contracting Officer and the Contractor upon mutual agreement as to its accuracy and completeness.

4. PROTECTION OF LAND AREAS. Except for any work or storage area and access route specifically assigned for the use of the Contractor under this contract, the land areas outside the limits of permanent work performed under this contract shall, in accordance with General Provisions Clause: Protection of Existing Vegetation, Structures, Utilities and Improvements, be preserved in their present condition. The Contractor shall confine his con-

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struction activities to areas defined for work on the plans or specifically assigned for his use. In accordance with General Provisions Clause: Operations and Storage Areas, storage and related areas and access routes required temporarily by the Contractor in the performance of the work will be assigned by the Contracting Officer.

5. PROTECTION OF TREES AND SHRUBS. General Provisions Clause: Protection of Existing Vegetation, Structures, Utilities and Improvements is hereby supplemented as follows: Except for trees or shrubs marked on the plans to be removed, the Contractor shall not deface, injure or destroy trees or shrubs, nor remove or cut them without special authority. No ropes, cables or guys shall be fastened to or attached to any existing nearby trees for anchorage.

5.1 TREE PROTECTIVE STRUCTURES. Any tree scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition, at the Contractor's expense. All scars or wounds, made by construction equipment or operations on trees not designated on the plans to be removed, shall be coated as soon as possible with an approved tree wound dressing. Trees that are to remain, either within or outside established clearing limits, that are so damaged by the Contractor as to be beyond saving in the opinion of the Contracting Officer, shall immediately be removed, if so directed, and replaced with a nursery-grown tree of the same size and species.

6. PROTECTION OF WATER RESOURCES. The Contractor shall control the disposal of fuels, oils, bitumens, calcium chloride, acids or harmful materials, both on and off the project area and shall comply with applicable Federal, State, County and Municipal laws, ordinances and regulations concerning pollution of rivers and streams while performing work under this contract. Special measures shall be taken to prevent chemicals, fuels, oils, greases, bituminous materials, herbicides and insecticides from entering surface or ground waters. Water used in on-site material processing, concrete curing, foundation and concrete or masonry cleanup, and other waste water shall not be allowed to enter a stream if, in the opinion of the Contracting Officer, an increase in the turbidity of the stream might result therefrom.

7. WASTE DISPOSAL. As part of his proposed implementation under paragraph 2, and prior to on-site construction, the Contractor shall submit a description of his scheme for disposing of waste materials resulting from the work under this contract. If any waste material is disposed of in unauthorized areas, the Contractor shall remove the material and restore the area to its original condition or to the condition of adjacent undisturbed areas, as the Contracting Officer may direct. Where directed, contami-

nated soil shall be excavated, disposed of as approved, and replaced with suitable fill material, at the expense of the Contractor.

8. BURNING. Air pollution restrictions applicable to this project are as follows: If the Contractor elects to dispose of waste materials by burning, he shall make his own arrangements for such burning area, and shall, as specified in General Provisions Clause: Permits and Responsibilities, conform to all applicable laws, ordinances and regulations.

9. DUST CONTROL. The Contractor shall maintain all excavations, embankments, stockpiles, access roads, waste areas, and all other work areas free from dust to such reasonable degree as to avoid causing a hazard or nuisance to the Using Service or to others. Approved temporary methods such as sprinkling, chemical treatment, or similar methods will be permitted to control dust. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs.

10. EROSION CONTROL.

10.1 Cuts and fills within the construction limits, whether or not completed, as well as borrow and waste disposal areas, shall be graded to limit erosion to acceptable limits. Temporary control measures shall be provided and maintained until permanent drainage facilities are completed and operative or, in the case of grassed areas, until a stable stand of grass exists. The area of bare soil exposed at any one time by construction operations shall be held to a minimum.

10.2 All erosion control measures shall be in accordance with the latest edition of the "Virginia Erosion and Sediment Control Handbook".

11. CORRECTIVE ACTION. The Contractor shall, upon receipt of a notice in writing of any noncompliance with the foregoing provisions, take immediate corrective action. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor, unless it is later determined that the Contractor was in fact in compliance.

12. POST-CONSTRUCTION CLEANUP OR OBLITERATION. In accordance with General Provisions Clause: Cleaning Up, the Contractor shall, unless otherwise instructed in writing by the Contracting Officer, obliterate all signs of temporary construction of what-

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ever nature, prior to final acceptance of the work. Disturbed areas shall be graded to provide positive drainage, and the entire area seeded or sodded as specified in paragraph 10.

ZERO ACCIDENTS

SECTION 1D
SPECIAL SAFETY REQUIREMENTS

INDEX

1. GENERAL. This section provides additional requirements for implementing the accident prevention articles in General Provisions clause: Accident Prevention, and Safety and Health Requirements Manual EM 385-1-1.

2. GROUND FAULT CIRCUIT INTERRUPTERS. In addition to the requirements of paragraph 15.C.09 of EM 385-1-1, ground fault circuit interrupters will be required for all extension cord systems.

3. PRECONSTRUCTION CONFERENCE. A preconstruction conference will be scheduled prior to beginning of site work, at which time representatives of the Contracting Officer will review and discuss requirements relative to planning and administration of the overall safety program.

4. ACCIDENT PREVENTION PROPOSAL. The Contractor shall have the option of submitting his own accident prevention proposal, or utilizing the basic safety program as outlined in subparagraphs 4.1 through 4.11. In the event that the Contractor submits his own proposal, it shall as a minimum cover the basic points as outlined in subparagraphs 4.1 through 4.11

4.1. RESPONSIBLE INDIVIDUAL. The Contractor shall designate an approved on-site employee as the individual responsible for ensuring that the accident prevention proposal is implemented and enforced, and that inspections of scaffolding, mechanical equipment and hand tools, etc., are made as required.

4.2. INDOCTRINATION OF EMPLOYEES BEFORE START OF WORK. The Contractor shall indoctrinate each employee to ensure that the following items are covered:

(a) Purpose of the accident prevention program (i.e., to minimize hazards and reduce injuries).

(b) Review of representative hazards on the job and the precautions to be taken.

(c) Location of first aid and other emergency facilities, and what to do in case of injury, fire or when a serious hazard is noted.

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(d) Time and location of Tool Box Safety Meetings.

(e) Required protective equipment such as goggles, respirators, lifelines and hard hats.

(f) Brief review of clean-up procedure.

(g) Location of company safety rules (posting or handout).

4.3. TOOL BOX SAFETY MEETINGS. The Contractor shall hold weekly Tool Box Safety Meetings for all Contractor employees Timely safety subjects shall be determined by a responsible individual. The Contractor shall submit written notice of the meeting to the Government Representative.

4.4. FIRE PROTECTION AND PREVENTION. The Contractor shall ensure that adequate fire extinguishers, water barrels and other fire fighting equipment is located on-site. Extinguishers shall be on hand wherever welding or cutting are being performed, when flammable materials are being used or installed, and at other special hazards.

4.5. HOUSEKEEPING. Daily clean-up of all debris and waste will be required. Adequate disposal containers shall be placed at strategic locations on-site. Debris shall be removed on a regular basis.

4.6. FIRST AID AND MEDICAL. First aid facilities shall be made available on the job site. Arrangements for emergency medical attention shall be made prior to the start of work. All emergency telephone numbers (doctor, hospital, ambulance, police and fire department) shall be posted at the office of the project superintendent.

4.7. SANITATION FACILITIES. Sufficient numbers of toilet facilities as specified in paragraph 03B of EM 385-1-1 shall be provided. Portable chemical toilets are authorized. Ensure that safe drinking water and individual cups are available. If corrosive or toxic products are used, separate washing facilities will be required.

4.8. SAFETY PROMOTION. The Contractor shall promote accident prevention by the use of one or more of the following: posters, display materials, safety contests, awards programs and similar methods.

4.10. ACCIDENT REPORTING. All accidents (employee injuries, vehicle, building, equipment or property damage, etc.), regardless of their severity, shall be reported to the on-site Government Representative or to the Area Engineer. The Contractor will be notified by the Contracting Officer of the forms to be submitted.

4.11. PHASE SAFETY PLANNING. Before each phase of work begins, a phase plan listing the possible hazards that might be expected while accomplishing that phase of the work and the procedures to be used to overcome or eliminate the hazards of that phase, shall be discussed by the Contractor and the on-site Government Representative. A phase is defined as an operation which presents hazards not experienced in previous operations (e.g., earth moving, trenching, concrete work, roofing, electrical work, masonry, etc.) or where new subcontractors are performing the work. The on-site Government Representative will determine the format and amount of detail required in the written plan. The amount of detail will be governed by the complexity of that phase of work.

SECTION 2A
CLEARING AND GRUBBING

INDEX

1. CLEARING shall consist of the felling, trimming and cutting of trees into sections, and the satisfactory disposal of the trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within the areas to be cleared. Trees, stumps, roots brush, and other vegetation in areas to be cleared shall be cut off flush with or below the original ground surface, except for such trees as may be indicated or directed to be left standing. Trees designated to be left standing within the cleared areas shall be trimmed of all branches to such heights and in such manner as may be indicated or directed. Limbs and branches to be trimmed shall be neatly cut close to the bole of the tree or main branches. Cuts more than 1-1/2 inches in diameter thus made shall be painted with an approved tree-wound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations by the erection of barriers or such other means as the circumstances require. Clearing shall also include the removal and disposal of structures that obtrude, encroach upon, or otherwise obstruct the work.

2. GRUBBING shall consist of the removal and disposal of stumps, roots larger than 3 inches in diameter, and matted roots from the designated grubbing areas. This material, together with logs, and other organic or metallic debris not suitable for foundation purposes, shall be excavated and removed to a depth of not less than 18 inches below the original surface of the ground in areas designated to be grubbed and in areas indicated as construction areas under this contract. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform with the original adjacent surface of the ground.

3. TREE REMOVAL. Where indicated or directed, trees and stumps that are designated as trees shall be removed from areas outside those areas designated for clearing and grubbing. This work shall include the felling of such trees and the removal of their stumps and roots as specified in paragraph: Grubbing. Trees shall be disposed of as specified in paragraph: Disposal of Cleared and Grubbed Materials.

4. DISPOSAL OF CLEARED AND GRUBBED MATERIALS. All logs, stumps, roots, brush, rotten wood, and other refuse from the clearing and grubbing operations shall become the property of the Contractor, and shall be removed from the work area and disposed of in accordance with applicable Federal, State and local laws, ordinances and regulations.

ZERO ACCIDENTS

SECTION 2B
EXCAVATION, FILLING AND BACKFILLING
FOR BUILDINGS

INDEX

1. APPLICABLE PUBLICATIONS. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the references thereto.

1.1 MILITARY STANDARDS.

MIL-STD-619B Unified Soil Classification for Roads, Airfields, Embankments and Foundations

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS.

D 1556-82 Density of Soil in Place by the Sand-Cone Method

D 2167-66 (R 1977) Density of Soil in Place by the Rubber-Balloon Method

1.3 VIRGINIA SOIL AND WATER CONSERVATION COMMISSION.

Virginia Erosion and Sediment Control Handbook (1980) (Basic designation: Erosion Control Handbook.)

2. DEFINITIONS.

2.1 SUITABLE MATERIALS include material that is free of debris, roots, organic matter, frozen matter, and which is free of stones with any dimension greater than one half of the specified loose layer thickness.

2.2 UNSUITABLE MATERIALS include all material that contains debris, roots, organic matter, frozen matter, stone with any

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dimension greater than one half the loose layer thickness, or other materials that are determined by the Contracting Officer as too wet or otherwise unsuitable for providing a stable subgrade or stable foundation for structures.

2.3 COHESIONLESS AND COHESIVE MATERIALS. Cohesionless materials are defined as materials classified in MIL-STD-619 as GW, GP, SW, and SP. Cohesive materials are defined as materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless when the fines are nonplastic, and cohesive when the fines are plastic.

2.4 NON-EXPANSIVE SOIL is defined as any material with 50 per cent or more grain sizes retained on a No. 200 sieve and having a plasticity index of less than 15 per cent.

2.5 EXPANSIVE SOIL is defined as any soil not included in the non-expansive definition above.

2.6 CAPILLARY WATER BARRIER MATERIALS are clean, crushed stone, crushed or uncrushed gravel composed of hard, durable particles. Maximum particle size shall be 1-1/2 inch and not more than 2 per cent of the particles shall be small enough to pass a No. 4 sieve.

2.7 ACCEPTABLE TOPSOIL shall be as specified in the Erosion Control Handbook.

2.8 DEGREE OF COMPACTION required is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1556-82, abbreviated herinafter as per cent ASTM D 1556 maximum density.

3. PROTECTION OF EXISTING VEGETATION, STRUCTURES, UTILITIES AND IMPROVEMENTS is specified in the General Provisions. Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained shall be protected from damage during excavation and backfilling, and if damaged, shall be repaired by the Contractor at his expense. Any existing utility lines that are to be retained and that are not shown on the drawings or the locations of which are not made known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Contractor, and adjustment in payment will be made.

4. CLEARING AND GRUBBING.

4.1 GENERAL. Unless otherwise shown, the areas within lines 10 feet outside of the building and 10 feet outside the Water

Storage Tank foundation shall be cleared of trees, stumps, roots, brush, and other vegetation, debris and other items that would interfere with construction operations. Stumps, logs, roots and other organic matter shall be completely removed. The resulting depressions shall be completely filled and compacted in accordance with paragraph: "Filling and Compaction" unless further excavation is required.

4.2 DISPOSAL OF CLEARED AND GRUBBED MATERIALS. Material removed shall be disposed of off-site at the Contractor's expense.

5. EXCAVATION.

Original (Red)

5.1 GENERAL. Excavation of every description and of whatever substances encountered shall conform to the dimensions and elevations indicated, except as specified herinafter, and shall include trenching for utility systems to a point 5 feet beyond the building and Water Storage Tank foundation line, and all work incidental thereto. Excavation shall extend a sufficient distance from walls and footings to allow for placing and removal of forms, installation of services, and for inspection, except where section: "CONCRETE" permits the concrete for footings to be deposited directly against excavated surfaces. Excavations shall not be carried below indicated depths except to remove unsuitable material. Unsuitable material which is encountered adjacent to or underlying the footings or floor slab shall be immediately reported to the Contracting Officer, who will define in writing the limit and depth of removal of such unsuitable material as the work proceeds. In cases where overexcavation is ordered to remove unsuitable material, an equitable adjustment in the contract price will be made in accordance with General Provisions paragraph: "Changes" to cover the additional cost of performing the overexcavation, disposing of the unsuitable material and backfilling the overexcavation. Material removed below the depths indicated without specific direction of the Contracting Officer shall be replaced at no cost to the Government, to the indicated excavation grade with suitable materials placed and compacted as specified in paragraph: "Filling and Compaction", except that concrete footings shall be increased in thickness to the bottom of overdepth excavations.

5.2 EXPLOSIVES. Explosives shall be used in public rights of way only with the prior written authorization of the Contracting Officer and in accordance with the requirements of the Virginia Department of Highways and Transportation. Explosives shall be used outside of public rights of way only with the prior written authorization of the Contracting Officer, and in accordance with the requirements of Roanoke County.

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5.3 DRAINAGE. Excavation shall be performed in such manner that the area of the site and the area immediately surrounding the site will be continually and effectively drained by gravity or temporary pumps. Water shall not be permitted to accumulate in the excavation. The excavation shall be drained by methods which will prevent the softening of the foundation bottom, undercutting of footings, or other conditions detrimental to proper construction procedures.

5.4 FOUNDATION PROTECTION. All foundation soils on which concrete footings are placed shall be protected from movement or other damage due to frost penetration. Soil backfill, insulation, heat, or other approved methods shall be used to protect the foundation during periods of the year in which frost penetration is possible.

5.5 SHORING, including sheet piling, shall be furnished and installed as necessary to protect workmen, banks, adjacent paving, structures and utilities. Shoring, bracing, and sheeting shall be removed as excavations are backfilled, in a manner to prevent caving.

5.6 BORROW. Where suitable materials are not available in sufficient quantity from all required excavations under this contract, approved materials shall be obtained from off-site sources at the Contractor's responsibility and expense.

5.7 DISPOSAL OF EXCAVATED MATERIALS. Suitable excavated material required for fill or backfill shall be placed in the proper section of the permanent work required under this section, or shall be separately stockpiled if it cannot be readily placed. Material in excess of that required for the permanent work and unsuitable material shall be disposed of off-site at the Contractor's responsibility and expense. Stockpiles and wasted materials shall be placed, graded and shaped for proper drainage and neat appearance, giving due consideration to drainage from adjacent properties, and in accordance with the Erosion Control Handbook.

5.8 FINAL GRADE. Care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before concrete is to be placed.

6. BACKFILLING shall not begin until construction below finish grade has been approved, underground utilities have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Backfill shall be brought to indicated finish grade. Backfill shall not be placed in wet or frozen areas. Backfill shall be of suitable materials placed and compacted as specified under paragraph: "Filling and Compaction".

Heavy equipment for spreading and compacting backfill shall not be operated closer to foundation walls than a distance equal to the height of backfill above the top of footing; the area remaining shall be compacted by power-driven hand tampers suitable for the material being compacted. Backfill shall be placed carefully around pipes to avoid damage to coatings. Backfill shall not be placed against foundation walls prior to 7 days after placement of the walls. As far as practicable, backfill shall be brought up evenly on each side of the wall, and sloped to drain away from the wall.

7. FILLING AND COMPACTION. Suitable material shall be used in fills and backfills and for replacing unsuitable material as defined hereinbefore. Sampling and testing shall be performed as hereinafter specified.

7.1 MOISTURE AND DENSITY DETERMINATIONS. Tests for determination of maximum density and optimum moisture shall be performed by the Contractor in accordance with the requirements of ASTM D 1556. Samples shall be representative of the materials to be placed. An optimum moisture-density curve shall be obtained for each principal type of material or combination of materials encountered or utilized. Results of these tests shall be the basis of control for compaction. The above testing shall include Atterberg limits, grain size determination, and specific gravity.

7.2 PREPARATION OF GROUND SURFACES. Unsuitable material in surfaces to receive fill or in excavated areas shall be removed and replaced with suitable materials, to the extent and depth directed by the Contracting Officer. The surface shall be scarified to a depth of 6 inches before the fill is started. Sloped surfaces steeper than 1 vertical to 4 horizontal shall be plowed, stepped, benched or broken up in such manner that the fill material will bond with the existing material. When subgrades are of less than the specified density, the ground surface shall be broken up, pulverized, and compacted to the density specified density in accordance with paragraph: "Compaction" hereinafter. When a fill is adjacent to a required excavation or natural ground, the excavated natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for the adjacent fill.

7.3 PLACING. The approved suitable materials shall be placed in successive horizontal uniformly spread layers of loose material not more than 6 inches thick, except that in areas not accessible or permitted for the use of self-propelled rollers or vibrators the loose layer shall be 4 inches thick. Fills shall not be placed until subgrade is checked and approved. Fills shall not be placed on muddy or frozen subbase. Topsoil shall be

placed on areas not to receive pavement or structures, in accordance with paragraph: "Topsoil Placing".

7.4 COMPACTION shall be accomplished by sheepsfoot rollers, pneumatic-tired rollers, steel-wheel rollers, or other approved equipment well suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used. When questionable or borderline materials are encountered, the Contracting Officer will determine the compaction requirements to be used. Cohesive soils shall be at a moisture content between 1 per cent below and 4 per cent above optimum moisture when compacted. Each layer shall be compacted to not less than the percentage of maximum density specified below:

	Per cent ASTM D 1556 Maximum Density	
	Cohesive Material	Cohesionless Material
Fill, backfill, and subgrade under paved areas and floor slab	90	95

7.5 TESTS FOR AND CONTROL OF DENSITY.

7.5.1 Sampling and Testing. All quality control sampling and testing shall be performed by the Contractor. See section: "Special Provisions", paragraph: "Contractor Quality Control".

7.5.2 Density Control. The Contractor shall adequately control his compaction operations by test made in accordance with ASTM Standard D 1556 or ASTM Standard D 2167 to ensure placement of materials within the limits of densities specified below. A minimum of two tests will be required for each 4,000 square feet or less of area filled or backfilled in each lift. The location of the tests shall be as directed by the Contracting Officer. The Contractor shall make as many additional tests as he requires to obtain the specified density at all points. Copies of all test results shall be furnished to the Contracting Officer. Tests may be made by the Government for verification of compliance; however, the Contractor shall not depend on such tests for his control of operations. Deficiencies in construction shall be corrected by the Contractor at no additional cost to the Government.

7.6 RECONDITIONING OF SUBGRADES. Approved compacted subgrades that are disturbed by Contractor's subsequent operations or adverse weather shall be scarified and compacted as

specified herinbefore to the required density prior to further construction thereon. Recompaction over underground utilities shall be by hand tamping.

8. CAPILLARY WATER BARRIER under concrete floor slab shall consist of materials as herinbefore defined. The capillary water barrier shall be placed directly on the subgrade after the subgrade has been approved for density and elevation requirements, and shall be compacted with a minimum of two passes of a hand-operated plate type compactor.

9. GRADING. Unless otherwise shown, the areas outside of the building and Water Storage Tank foundation line required to be graded shall be constructed true to grade, shaped to drain, and shall be maintained free of trash and debris until final inspection has been completed and the work has been accepted.

10. TOPSOIL PLACING. Areas outside the building and Water Storage Tank foundation line, except paved or otherwise surfaced areas, which are disturbed by work under this contract shall be topsoiled, tilled, limed, fertilized and seeded or sodded in accordance with the Erosion Control Handbook.

11. PROTECTION. Settlement or washing that occurs in graded, topsoiled or backfilled areas prior to acceptance of the work shall be repaired and grades reestablished to the required elevations and slopes.

ZERO ACCIDENTS

SECTION 2C
EXCAVATION, TRENCHING AND BACKFILLING
FOR WATER LINES

INDEX

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 MILITARY STANDARDS (Mil. Std.).

MIL-STD-619B	Unified Soil Classification System for Roads, Airfields, Embankments and Foundations

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 1556-82	Density of Soil In Place by the Sand-Cone Method
D 1557-78	Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10-lb (4.54 kg) Rammer and 18-inch (457 mm) Drop
D 2167-66 (R 1977)	Density of Soil In Place by the Rubber Balloon Method
E 548-79	Generic Criteria for Use in the Evaluation of Testing and Inspection Agencies

2. DEFINITIONS.

2.1 SATISFACTORY MATERIALS. Satisfactory materials shall consist of any material not listed as unsatisfactory.

2.2 UNSATISFACTORY MATERIALS. Unsatisfactory materials include but are not limited to those materials containing roots and other organic matter, trash, debris, frozen materials and stones larger than 3 inches, and materials classified in MIL-STD-619 as ML, PT, OH, and OL. Unsatisfactory materials also include landfills, refuse, or debris from previous construction.

2.3 COHESIONLESS AND COHESIVE MATERIALS. Cohesionless materials include materials classified in MIL-STD-619 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be defined as cohesionless only when the fines are nonplastic.

2.4 ROCK. Rock shall consist of boulders measuring 1/2 cubic yard or more and materials that cannot be removed without systematic drilling and blasting, such as material in ledges, bedded deposits, unstratified masses and conglomerate deposits, and below ground concrete or masonry structures, exceeding 1/2 cubic yard in volume, except that pavements will not be considered as rock.

2.5 UNSTABLE MATERIAL. Unstable material shall consist of materials too wet to properly support the water pipe, conduit or appurtenant structures.

2.6 SELECT GRANULAR MATERIAL. Select granular material shall consist of well-graded sand, gravel, crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, and shall not contain more than 10 per cent by weight of material passing a No. 200 mesh sieve and no less than 95 per cent by weight passing a 1-inch sieve, with a maximum allowable aggregate size of 1 inch or the maximum size recommended by the pipe manufacturer, whichever is smaller, unless otherwise specified.

2.7 DEGREE OF COMPACTION. Degree of compaction shall be expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D 1557.

PART 2 - EXECUTION

3. EXCAVATION. Excavation of every description and of whatever substances encountered shall be performed to the lines and grades indicated. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner at a distance from the banks of the trench sufficient to avoid overloading and to prevent slides or cave-ins. Adequate drainage shall be provided for the stockpiles and surrounding areas by means of ditches, dikes, or other approved methods. The stockpiles shall also be

protected from contamination with unsatisfactory excavated material or other material that may destroy the quality and fitness of the suitable stockpiled material. If the Contractor fails to protect the stockpiles and any material becomes unsatisfactory as a result, such material, if directed, shall be removed and replaced with satisfactory on-site or imported material at no additional cost to the Government. Excavated material not required or not satisfactory for backfill shall be disposed of off-site. Grading shall be done as necessary to prevent surface water from flowing into the excavation, and any water accumulating therein shall be removed so that the stability of the bottom and sides of the excavation is maintained. Unauthorized overexcavation shall be backfilled in accordance with paragraph: "Backfilling" at no additional cost to the Government.

3.1 TRENCH EXCAVATION. The trench below the top of the pipe shall not be excavated wider than the outside diameter of the pipe plus 24 inches. Where trench widths are exceeded, redesign using stronger pipe or special installation procedures may be necessary, and the cost of such design and increased cost of pipe or installation shall be borne by the Contractor, with no additional cost to the Government. Trench walls below the top of the pipe shall be as nearly vertical as possible. Trench walls above the top of the pipe may be sloped or widened as necessary for the proper performance of the work.

3.1.1 Bottom Preparation. Trench bottoms shall be overexcavated to allow the installation of granular bedding as detailed on the drawings. Stones greater than 3 inches in diameter, or such diameter as the manufacturer of the pipe may recommend, encountered at the bottom of the trench shall be removed and the void backfilled with suitable material.

3.1.2 Removal of Rock. Where rock is encountered in the bottom of the trench, such material shall be removed to a depth of 6 inches below the required grade and replaced with suitable material as provided in paragraph: "Backfilling".

3.1.3 Removal of Unsuitable Material. Where unstable material is encountered in the bottom of the trench, such material shall be removed to the depth directed and replaced to the proper grade with select granular material as provided in paragraph: "Backfilling". When removal of unstable material is required due to the fault or neglect of the Contractor in his performance of work, the resulting material shall be excavated and replaced by the Contractor at no additional cost to the Government.

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3.2 EXCAVATION FOR APPURTENANCES. Excavations for manholes or similar structures shall be of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations. Rock shall be cleaned of loose debris and cut to a firm surface either level, stepped or serrated, as directed. Loose disintegrated rock and thin strata shall be removed. Removal of unstable material shall be as specified above. When concrete is to be placed in an excavated area, special care shall be taken not to disturb the bottom of the excavation. Excavation to the final grade level shall not be made until just before the concrete or masonry is to be placed.

3.3 DEWATERING. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed, therein is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result. All excavations for concrete structures or trenches which extend down to or below ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations 12 inches or more below the bottom of the excavation. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property. Existing drainage facilities may be used for disposal of surface and ground water during dewatering operations, subject to the prior approval of the Contracting Officer. The Contractor shall be responsible for all damages incurred by the drainage facilities as a result of the dewatering operations. All pipes and conduits shall be left clean and free of sediment.

3.4 SHEETING AND SHORING. Except where banks are cut back on a stable slope, excavation for structures and trenches shall be sheeted, braced, and shored, as necessary, to prevent caving or sliding, to provide protection for workmen and the work, and to provide protection for existing structures and facilities. Sheeting, bracing, and shoring shall be designed and built to withstand all loads that might be caused by earth movement or pressure, and shall be rigid, maintaining shape and position under all circumstances.

4. BACKFILLING. Backfill material shall consist of satisfactory material. Backfill shall be placed in layers not exceeding 6 inches loose thickness for compaction by hand operated machine compactors, and 8 inches loose thickness for other than hand operated machines, unless otherwise specified. Each layer shall be compacted to at least 95 per cent maximum density for

cohesionless soils and to 90 per cent maximum density for cohesive soils, unless otherwise specified.

4.1 TRENCH BACKFILL. Trenches shall be backfilled to the grade shown. The trench shall be backfilled to 2 feet above the top of the pipe prior to performing the required pressure test. The joints and couplings shall be left uncovered during the pressure test.

4.1.1 Replacement of Unstable Material. Unstable material removed from the bottom of the trench or excavation shall be replaced with select granular material placed in layers not exceeding 6 inches loose thickness.

4.1.2 Bedding. Bedding shall conform to the details shown on the drawings and specified below. Material shall be deposited in 6 inch thick loose layers and compacted with approved methods to at least 95 per cent maximum density. Care shall be taken to ensure thorough compaction of the fill under the pipe haunches. Bedding shall consist of select granular material. A maximum allowable aggregate size of 1/2 inch shall be used for all pipe.

4.1.3 Initial Backfill. Initial backfill shall consist of satisfactory materials with a maximum stone size not exceeding 1/2 inch. Initial backfill shall be placed in 6-inch loose thickness layers and compacted to at least 90 per cent of maximum density at moisture contents that will facilitate compaction in granular materials and shall be within ±2 per cent of optimum for all other materials. Initial backfill shall be placed to a height of at least 1 foot above the top of the pipe. Care shall be taken to ensure thorough compaction under the haunches of the pipe.

4.1.4 Final Backfill. The remainder of the trench shall be backfilled with satisfactory material. Backfill material shall be deposited and compacted as follows:

4.1.4.1 Roadways and Driveways. Backfill shall be placed up to the elevation of the base course in 6-inch layers and compacted to 95 per cent maximum density. Base course shall be compacted to 100 per cent maximum density. Pavement shall conform to paragraph: "Pavement and Walk Removal and Replacement". Water flooding, puddling, or jetting methods of compaction will not be permitted.

4.1.4.2 Walks, Sodded or Seeded Areas and Miscellaneous Areas. Backfill shall be deposited in layers of a maximum of 12-inch loose thickness, and compacted to 85 per cent maximum density for cohesive soils and 90 per cent maximum

density for cohesionless soils. Compaction by water flooding, puddling, or jetting will not be permitted. The requirements of this paragraph shall apply to all other areas not otherwise specifically designated.

4.2 BACKFILL FOR APPURTENANCES. After the manhole or similar structure has been constructed and concrete or mortar allowed to cure for at least 5 days, backfill shall be placed in such a manner that the structure will not be damaged by the shock of falling earth. The backfill shall be deposited and compacted as specified for final backfill, and shall be placed in such a manner as to prevent eccentric loading or excessive stress on the structure.

5. SPECIAL REQUIREMENTS. Special requirements for both excavation and backfill are as follows:

5.1 COVER. Trenches shall be of a depth to provide a minimum cover of 3 feet from finished grade to top of pipe.

5.2 PLASTIC MARKING TAPE. Warning tape shall be of the type specifically manufactured for marking and locating underground utilities. The tape shall be installed directly above the pipe, at a depth of 18 inches below the finished grade unless otherwise shown or directed. The tape shall be blue, acid and alkali-resistant polyethylene film, 6 inches wide with a minimum thickness of 0.004 inch and shall have a minimum strength of 1750 p.s.i. lengthwise and 1500 p.s.i. crosswise, with an elongation factor of 350 percent. The tape shall bear a continuous printed inscription the words "WATER MAIN" or other phrase of similar import.

6. TESTING. Testing shall be the responsibility of the Contractor, and shall be performed at no additional cost to the Government.

6.1 DETERMINATION OF DENSITY. Density tests shall be performed by an approved commercial testing laboratory, or may be performed using facilities provided by the Contractor. Approval of testing facilities will be based on compliance with ASTM E 548, and no work requiring testing will be permitted until the facilities have been inspected and approved by the Contracting Officer. Tests shall be performed in sufficient numbers to ensure that the specified density is being obtained for each lift and for any change in the type of backfill material being used. A minimum of one test per 500 feet of installation shall be performed. Laboratory tests for moisture-density relationships shall be determined in accordance with ASTM D 1557. Field in-place density shall be determined in accordance with ASTM D 1556 and ASTM D 2167. Trenches improperly compacted shall be reopened to the depth directed, then refilled and compacted to the density specified, at no additional cost to the Government.

7. PAVEMENT AND WALK REMOVAL AND REPLACEMENT.

7.1 FLEXIBLE PAVEMENT. Where construction requires cutting and replacing of flexible pavement, cutting shall be so accomplished that the remaining exposed edges shall conform vertically and horizontally to a straight line. The full depth of surface and binder course shall be removed to a width of 10 feet with a saw cut at the edges. Base course shall be removed to a point 1 foot (minimum) to 2 feet (maximum) back from each side of the trench. The pavement replaced shall match the existing in materials.

7.2 CONCRETE PAVEMENT, CURB, CURB AND GUTTER, AND WALKS. Where construction requires cutting of concrete pavement, concrete curb, concrete curb and gutter or concrete walks, the item in question shall be removed to the nearest joint, but not less than 1 foot from the edge of the trench. The replaced section shall match the existing section in shape, reinforcement and section, and shall be 3000 p.s.i. concrete, air-entrained. Waste materials shall be disposed of as specified elsewhere for this contract.

7.3 PAVEMENT REPLACEMENT FOR STATE OF VIRGINIA HIGHWAYS. Where construction requires cutting of state highway pavements, the Contractor shall obtain a State Highway Permit and perform cutting and replacement work in accordance with the attached Virginia Department of Highways requirements.

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VIRGINIA DEPARTMENT OF HIGHWAYS
PAVEMENT PATCHING REQUIREMENTS

1. All patches are to be replaced in accordance with the attached sheet showing the required method of replacing cuts.

2. The Permittee will be required to restore the surface and the base of the roads included under this permit in a manner suitable to the Virginia Department of Highways and Transportation, either by resurfacing these streets with a prime and seal treatment to their original width or by a bituminous concrete patch as indicated on the attached sketch ("Required Methods of Replacing Cuts"). The surface treatment is to be applied in the following manner: 10" of approved base material compacted to 100% density is applied over the entire width of trench excavation and the entire surface is then scarfied to its original width with enough Type-1 stabilizing materials added to provide a satisfactory surface for the bituminous prime treatment. The surface is then to be shaped and maintained for a period of not less than one week open to traffic to achieve compaction with sufficient moisture added at that time, either calcium chloride or water, to allay dust and provide good compaction. The prime treatment of CRS-2 type asphalt to be applied at the rate of 0.3 gallon per sq. yard and immediately covered with 25 pounds per square yd. of #8 crushed stone, this prime treatment is allowed to stand for a period of at least 24 hours, then the seal is applied at the rate of 0.3 gallon CRS-2 per sq. yd., and immediately covered with 25 pounds per sq. yd. of #8 crushed stone. During the process of placing this prime and seal, it shall be rolled by self-powered, self-propelled unit with a manufacturer's rating of 7 to 10 tons. All material used to conform with Virginia Department of Highways and Transportation Specifications.

3. All base material applied must conform with the Virginia Department of Highways and Transportation Specifications for base material.

4. The Permittee shall see that dusty conditions are kept to a minimum, either by the addition of water or calcium chloride at all times.

5. The Department of Highways and Transportation may, at its discretion, reject backfill material which it feels to be unsuitable.

6. No bituminous material shall be applied between November 1 and April 1, except by written authorization from the Virginia Department of Highways and Transportation and treatment shall be applied only when the atmospheric temperature is above 50 degrees and when the weather is not foggy and damp.

7. When the installation is made in the shoulder or other traveled portions of roadway which are not hardsurfaced, the top 10" of trench must be replaced with good bank gravel or crushed run stone with a capping of crushed run material over the entire shoulder.

8. Permittee shall restore all disturbed drainage facilities immediately and provide positive drainage.

A. Applicants to whom permits are issued shall at all times indemnify and save harmless to the State Highway and Transportation, Commission and Commonwealth of Virginia from responsibility, damages, or liability arising from the exercise granted in such permit.

B. A permit may be denied any applicant, and all permits issued by the State Highway and Transportation Commission may be revoked, whenever, in the opinion of the State Highway and Transportation Commissioner, the safety, use or maintenance of the highway so requires.

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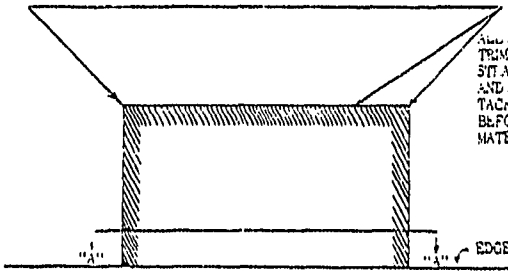
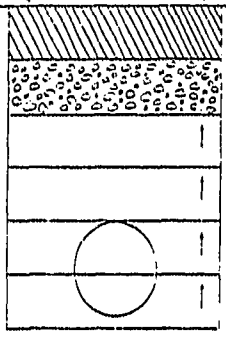
REQUIRED METHODS FOR REPLACING CUTS



SHOULDER AND DITCH LINE TO BE REPLACED TO CONFORM WITH EXISTING SHOULDERS AND DITCH. ADD CRUSHER RUN BLUE STONE TO SHOULDERS

Patch to conform with elevation of all sides

BOTTOM & ALL SIDES OF CUT TO BE PRIMED WITH ASPHALT PRIOR TO PLACING PLANT MIX.



S-5 PLANT MIX 1½ TIMES THICKNESS OF EXIST. SURFACE. MIN. 2"

10" STABILIZED MATERIAL TYPE I, SIZE 21-A, COMPACTED TO 100% MAXIMUM DENSITY.

BACKFILLED IN 6" LAYERS EACH LAYER COMPACTED TO 95% DENSITY (INCLUDES ALL DISTURBED AREAS ON VA. DEPT. OF HWYS. RIGHT OF WAY).

NOTE:
IF CUT IS MADE IN GRAVEL ROADWAY, 2" PLANT MIX SURFACE TO BE DELETED & TOP 12" OF STABLIZED BASE IS TO CONFORM WITH THE EXISTING SURFACE. EACH PAVEMENT CUT SHALL BE COVERED WITH A TEMPORARY OR PERMANENT ASPHALT PATCH THE SAME DAY EXCAVATION IS MADE.

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ZERO ACCIDENTS

SECTION 2D
WATER LINES

INDEX

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATION (Fed. Spec.).

L-C-530B & Am-1 & Int. Am-2	Coating, Pipe, Thermoplastic Resign or Thermosetting Epoxy
L-P-1035A	Plastic Molding Material, Vinyl Chloride Polymer and Vinyl Chloride-Vinyl Acetate Copolymer, Rigid
WW-V-54D	Valve, Gate, Bronze, (125, 150, and 200 Pound, Threaded Ends, Flanged Ends, Solder Ends, and Brazed Ends for Land Use)

1.2 AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI) STANDARDS.

A21.4-1980	Cement-Mortar Lining for Ductile-Iron and Gray-Iron Pipe and Fittings for Water
A21.11-1980	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
A21.51-1981 & Erratum	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids
B2.1-1968	Pipe Threads (Except Dryseal)
B16.1-1975	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800

1.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

B 88-83	Seamless Copper Water Tube

1.4 AMERICAN WATER WORKS ASSOCIATION (AWWA) STANDARDS.

C110-82	Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
C203-78	Coal-Tar Protective Coatings and Linings for Steel Water Pipelines - Enamel and Tape - Hot Applied

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C500-80 & Correction	Gate Valves, 3 In. Through 48 In. NPS, for Water and Sewage Systems
C502-80 & Errata (July 1981)	Dry-Barrel Fire Hydrants
C600-82	Installation of Ductile-Iron Water Mains and Their Appurtenances
C601-81	Disinfecting Water Mains
C800-66	Threads for Underground Service Line Fittings

2. GENERAL. This section covers water supply lines, water service lines, and connections to building service.

2.1 PIPING FOR WATER SERVICE LINES. Piping for water service lines shall be copper tubing, unless otherwise shown or specified.

2.2 PIPING OTHER THAN WATER SERVICE LINES. Piping for other than water service lines shall be ductile iron, unless otherwise shown or specified.

2.3 RECOMMENDATIONS OF THE MANUFACTURER. The Contractor shall, as a part of the shop drawings, submit to the Contracting Officer the manufacturer's recommendations for each material or procedure to be utilized which is in accordance with such recommendations. The Contractor shall have a copy of the manufacturer's instructions available at the construction site at all times and shall follow these instructions unless otherwise directed by the Contracting Officer.

3. EXCAVATION, TRENCHING, AND BACKFILLING FOR WATER LINES. Excavation, trenching, and backfilling shall be in accordance with the applicable provisions of SECTION: EXCAVATION, TRENCHING, AND BACKFILLING FOR WATER LINES except as modified herein.

4. SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit data for the following items required by this section.

4.1 CATEGORY I. None.

4.2 CATEGORY II.

4.2.1 For Approval.
Mechanical Cutter
Pipe Joints
Connections
Hydrostatic Tests

4.2.2 For Information Only.
Manufacturer's Recommendations (Para. 2.4)

PART 2 - PRODUCTS

5. MATERIALS shall conform to the respective specifications and other requirements specified below:

5.1 PIPE.

5.1.1 Copper Tubing. ASTM B 88, Type K, annealed.

5.1.2 Ductile-Iron Pipe. Water line and blowoff line pipe shall conform to ANSI A21.51, working pressure not less than 300 psi and a minimum depth of bury of 3 feet unless otherwise shown or specified. Pipe shall be cement-mortar lined in accordance with ANSI A21.4. Linings shall be

standard thickness. All ductile cast-iron piping, valves, fire hydrants, and fittings in direct contact with soil backfill shall be provided with a cathodic protection system in accordance with SECTION: CATHODIC PROTECTION (GALVANIC ANODE TYPE) and shall be coated and/or wrapped with one of the materials specified below. ORIGINAL (Red)

5.1.2.1 Plastic Resin System. Fed. Spec. L-C-530, Type I; or L-P-1035, composition, type, class, and grade suitable for the purpose, thickness as required for the Type I system of Fed. Spec. L-C-530.

5.1.2.2 Epoxy System. Fed. Spec. L-C-530, Type II.

5.1.2.3 Coal-Tar System. Primer and enamel conforming to AWWA C203. The thickness of the dry coating system shall be not less than 1/16 inch at any point.

5.2 JOINTS.

5.2.1 Copper Tubing. Joints shall be compression-pattern flared and shall be made with fittings hereinafter specified.

5.2.2 Ductile-Iron Pipe.

5.2.2.1 Mechanical Joints shall conform to ANSI A21.51 with rubber gasket joints which shall conform to ANSI A21.11.

5.2.2.2 Push-on Joints shall conform to ANSI A21.11.

5.2.2.3 Restraint Joints where called for on the drawings shall be Lok-Fast Joint as manufactured by the American Cast Iron Company, SuperLock as manufactured by Clow Corp., or retainer glands conforming to ANSI/AWWA C111/A21.11 or approved equal.

5.2.2.4 Rubber Gaskets and Lubricant shall conform to the applicable requirements of ANSI A21.11.

5.2.2.5 Flanged Joints shall be used only inside of structures and at the connection to the existing water line, and shall conform to AWWA C110 or ANSI B16.1. Flanged joints shall be suitable for a working pressure of 150 psi.

5.2.3 Bonded Joints. For ferrous piping, a metallic bond shall be provided at each joint, including joints made of flexible couplings, calking or rubber gaskets, of ferrous metal piping to effect continuous conductivity. The bond wire shall be type RHW-USE, size 1/0 neoprene jacketed copper conductor shaped to stand clear of the joint. The bond shall be of the thermal weld type. Test leads shall be provided in accordance with the details shown on the drawings. Test leads shall be placed at intervals not exceeding 300 feet, on pipe casings, and where the pipe crosses within 6 inches of any other metal pipe (provide 2 test leads at such locations, one for each pipe). Test leads will not be required within 300 feet of a riser pipe or any other place where the pipe will be readily accessible. The Contractor shall provide a plan showing the dimensioned location of all test leads. Test leads and bond connections shall be made with the exothermal weld process, insulated with coal tar mastic, and protected with a weld shield or plastic weld cap.

5.2.4 Insulating Joints shall be installed between new and existing piping. Insulating joints shall consist of a sandwich type flange dielectric insulating gasket, insulating washers, and insulating sleeves for flange bolts. Insulating gaskets shall be full faced with outside diameter equal to the flange outside diameter. Bolt insulating sleeves shall be full length.

5.3 FITTINGS AND SPECIALS.

5.3.1 For Copper Tubing. Fittings and specials shall be flared and conform to ANSI B16.26.

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5.3.2 For Ductile-Iron Pipe. Fittings and specials shall be suitable for 300 psi pressure rating, unless otherwise specified. Fittings and specials for mechanical joint pipe shall conform to AWWA C110. Fittings and specials for use with push-on pipe shall conform to AWWA C110 and ANSI A21.4. Fittings and specials shall be cement mortar lined in accordance with ANSI 21.4. Linings shall be standard thickness.

5.4 DIELECTRIC FITTINGS shall be installed between new and existing piping. Dielectric fittings shall prevent metal to metal contract of dissimilar metallic piping elements and shall be suitable for the required working pressure.

5.5 VALVES.

5.5.1 Check Valves or Backflow Preventers shall be designed for a working pressure not less than 300 psi. Connections shall be as required for the piping in which they are installed.

5.5.2 Gate Valves shall be designed for a working pressure of not less than 300 psi. Valve connections shall be as required for the piping in which they are installed. Valves shall have a clear waterway equal to the full nominal diameter of the valve, and shall be opened by turning counter-clockwise. The operating nut or wheel shall have an arrow, cast in the metal, indicating the direction of opening.

5.5.2.1 Valves Smaller than 3 Inches shall be all bronze and shall conform to Fed. Spec. WW-V-54, Type I, Class B.

5.5.2.2 Valves 3 Inches and Larger shall be iron body, bronze mounted, and shall conform to AWWA C500. Flanges shall not be buried. An approved pit shall be provided for all flanged connections.

5.5.3 Pressure Reducing Valves shall be bronze body, designed for a working pressure of not less than 300 psi, and shall conform to County of Roanoke water system standards.

5.5.4 Vacuum and Air Relief Valves shall be designed for a working pressure of not less than 300 psi and shall be a 1-inch APCO 200A or equal, conform to County of Roanoke water systems standards, see drawings.

5.5.5 All valves in contact with the earth will be coated the same as ductile cast iron pipe.

5.6 MANHOLES. Manholes shall conform to County of Roanoke water system standards, see drawings.

5.7 FIRE HYDRANTS. Fire hydrants shall conform to AWWA C502 and County of Roanoke water system standards. Fire hydrants in contact with the earth will be coated the same as ductile cast iron pipe.

5.8 MISCELLANEOUS ITEMS.

5.8.1 Corporation Stops shall have standard corporation stop thread conforming to AWWA C800 on the inlet end, with flanged joints, compression pattern flared tube couplings, or wiped joints for connections to goosenecks, see drawings.

5.8.2 Goosenecks. Copper tubing for gooseneck connections shall conform to the applicable requirements of ASTM B 88, Type K, annealed. Length of connections shall be in accordance with standard practice.

5.8.3 Service Stops shall be waterworks inverted ground key type, oval or round flow way, tee handle, without drain. Pipe connections shall be suitable for the type of pipe used. All parts shall be of bronze with female iron pipe size connections or compression pattern flared tube couplings, and shall be designed for a hydrostatic test pressure of not less than 200 psi.

ORIGINAL (Red)

5.8.4 Service Boxes shall be cast iron. Extension service boxes of the required length and having either screw or slide type adjustment shall be installed at all service box locations. The boxes shall have housings of sufficient size to completely cover the service stop and shall be complete with identifying covers.

5.8.5 Water Meters shall conform to County of Roanoke water system standards.

5.8.6 Meter Boxes shall conform to County of Roanoke water system standards, see drawings.

5.8.7 Flexible Joints shall be reinforced neoprene flexible rubber spool with single unfilled arch, steel retaining rings, and control units, Style 100 as manufactured by Metraflex Co., or equal.

PART 3 - EXECUTION

6. INSTALLATION.

6.1 HANDLING. Pipe and accessories shall be handled so as to insure delivery to the trench in sound, undamaged condition. Particular care shall be taken so as not to injure the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. No other pipe or material of any kind shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. The use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved methods. Before laying, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the Government.

6.2 CUTTING OF PIPE. Cutting of pipe shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise recommended by the manufacturer and authorized by the Contracting Officer, cutting shall be done with an approved mechanical type cutter. Wheel cutter shall be used when practicable. Copper tubing shall be cut square and all burs shall be removed. Squeeze type mechanical cutters shall not be used for ductile iron.

6.3 ADJACENT FACILITIES.

6.3.1 Sewer Lines. Where the location of the water line is not clearly defined on the drawings, the water pipe shall not be laid closer than 10 feet horizontally from a sewer, except where the bottom of the water pipe will be at least 12 inches above the sewer pipe, in which case the water pipe shall not be laid closer than 6 feet from the sewer. Where water lines cross under gravity flow sewer lines, a 20-foot section of sewer line, capable of withstanding 15 psi internal pressure, shall be centered over the crossing. Water lines shall, in all cases, cross above sewage force mains or inverted siphons and shall be not less than 2 feet above the sewer main. No joints shall be located within 6 feet of the crossing.

6.3.2 Other Utilities. Water lines shall not be laid in the same trench as any other utility line. Where ferrous water lines cross any nonferrous utility lines, a minimum vertical separation of 12 inches shall be maintained.

6.3.3 Roads. Water lines crossing public roads and highways shall be encased in a rigid casing at the locations shown on the drawings, in accordance with the requirements of the Virginia Department of Highways and Transportation and these specifications. In the event of a conflict between requirements, the more stringent requirement shall govern. Casing pipe shall be installed by boring unless otherwise indicated. Bore holes shall be mechanically bored and cased using a cutting head and a continuous auger mounted inside the casing pipe. Casing shall be installed simultaneously with the boring of the hole. Boring methods using water will not be permitted. Casing pipe shall be welded steel pipe with a minimum yield strength of 35,000 psi and a minimum wall thickness of 1/4 inch. Joints in the casing pipe shall be welded. Water pipe inside the casing shall be supported as detailed on the drawings.

6.4 JOINT DEFLECTION. The maximum allowable deflection for ductile-iron pipe shall be as given in AWWA C600. If the alinement requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

6.5 PLACING AND LAYING.

6.5.1 Pipe and Accessories shall be carefully lowered into the trench by means of derricks, ropes, belt slings, or other authorized equipment. Under no circumstances shall any water line materials be dropped or dumped into the trench. Care shall be taken to avoid abrasion of the pipe coating. Except where necessary in making connections with other lines or as authorized by the Contracting Officer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly on the pipe bed, with recesses excavated to accommodate pipe bells, couplings, joints, and fittings. Pipe that has had the grade or joint disturbed after laying shall be taken up and relaid. Pipe shall not be laid in water or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joining is completed. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by the Contractor at his expense in a satisfactory manner. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

6.5.2 Connections. Where connection is made between new and existing lines, the connections shall be made by using specials and fittings to suit the actual conditions. Standard methods are available for making connections to various types of pipe, either under pressure or in the dewatered condition. Where made under pressure, these connections shall be installed as approved by the Contracting Officer.

6.6 JOINTING.

6.6.1 Copper Tubing. Joints shall be made with flared fittings. The flared end tube shall be pulled tightly against the tapered part of the fitting by a nut which is part of the fitting, so there is metal-to-metal contact.

6.6.2 Ductile-Iron Pipe. Mechanical and push-on type joints shall be installed in accordance with AWWA C600.

6.6.3 Bonded Joints shall be installed in accordance with details specified for joints under paragraph: MATERIALS.

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6.6.4 Dielectric Fittings shall be installed in accordance with details specified for joints under paragraph: MATERIALS. Dielectric unions shall be encapsulated in a field poured coal tar covering, with at least 1/8-inch thickness of coal tar over all fitting surfaces.

6.6.5 Connections Between Different Types of Pipe and accessories shall be made with transition fittings approved by the Contracting Officer.

6.7 SERVICE LINES. Service lines shall include the pipeline connecting the existing building piping to water lines. All service lines and valves shall be provided with extension service boxes of the lengths required by the depth of service line stops or valves. Service lines shall be the same nominal diameter as the existing pipes to which they will be connected. They shall be connected to the main by a directly tapped corporation stop. A corporation stop and a copper gooseneck shall be provided with either type of connection. Maximum sizes for directly tapped corporation stopes shall be as in Table I.

6.8 SETTING OF FIRE HYDRANTS, VALVES, AND VALVE BOXES.

6.8.1 Fire Hydrants shall be located and installed as shown. Each hydrant shall be connected to the main with a 6-inch branch line unless otherwise shown. Cover shall be at least as much as that of the main. Hydrants shall be set plumb with pumper nozzle facing the roadway and the center of the outlet not less than 18 inches above the finished surrounding grade, and the operating nut not more than 48 inches above the finished surrounding grade. Except where otherwise approved, backfill around hydrants shall be thoroughly compacted immediately after installation, to insure beneficial use of the hydrant as soon as practicable. The hydrant shall be set on a slab of concrete not less than 4 inches thick and 15 inches square. Not less than 7 cubic feet of free draining broken stone or gravel shall be placed around and under the waste opening of dry barrel hydrants to insure drainage.

6.8.2 Valves and Valve Boxes shall be installed where shown or specified, and shall be set plumb. Valve boxes shall be centered on the valves. Boxes shall be installed over each outside gate valve unless otherwise shown. Where feasible, valves shall be located outside of paved areas or private driveways and parking areas. Earth fill shall be carefully tamped around valve boxes to a distance of 4 feet on all sides of the box, or to the undisturbed face of the trench if less than 4 feet.

6.8.3 Hydrants and Valves after delivery shall be drained to prevent freezing and shall have interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the hydrant or valve shall be fully opened and closed to insure that all parts are in working condition.

6.8.4 Service Boxes. Where water lines are located below paved areas having curbs, the boxes shall be installed 2 feet back of the curbs. Where no curb exists, service boxes shall be installed in accessible locations, beyond the limits of street surfacing, walks and driveways.

6.8.5 Check Valves, Backflow Preventers, Pressure Reducing Valves, and Vacuum and Air Relief Valves shall be installed in accordance with the requirements of the County of Roanoke water system.

6.8.6 Blowoff Valves shall be installed in the same manner as gate valves.

6.9 THRUST AND ANCHOR BLOCKS. Plugs, caps, tees, and bends deflecting 22-1/2 degrees or more, either vertically or horizontally, on water mains, and all fire hydrants, shall be provided with thrust or anchor blocks. Metal tie rods and clamps or lugs may be used in lieu of blocks at locations approved by the Contracting Officer. Valves shall be securely anchored or shall be provided with blocking to prevent movement. Blocking shall be concrete of a mix not leaner than 1 part cement, 2-1/2 parts sand, and 5 parts gravel, having a compressive strength of not less than 3,000 psi after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated, the base and thrust bearing sides of the blocks shall be poured directly against undisturbed soil. The sides of blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown on the drawings for a soil bearing pressure of 1,500 p.s.f. Blocking shall be so placed that the fitting joints will be accessible for repair. Steel rods and clamps shall be protected by coating with bituminous paint.

7. HYDROSTATIC TESTS. Where any section of water line is provided with concrete blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 5 days after the pouring of the concrete, unless otherwise approved. The method proposed for the disposal of waste water from hydrostatic tests and disinfection shall be submitted to the Contracting Officer for approval prior to performing hydrostatic tests.

7.1 PRESSURE TEST. After the pipe is laid, the joints completed, fire hydrants permanently installed, and the trench partially backfilled leaving the joints exposed for examination, the newly laid piping or any valved section shall, unless otherwise specified, be subjected for 1 hour to a pressure test of 350 psi. Each valve shall be opened and closed several times during the test. Exposed pipe, fittings, valves, and hydrants shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade as necessary. Cracked or defective pipe, joints, fittings valves, or hydrants discovered in consequence of this pressure test shall be removed and replaced with sound material, and the test shall be repeated until the test results are satisfactory. The requirement for the joints to remain exposed for the hydrostatic tests may be waived by the Contracting Officer when one or more of the following conditions is encountered:

a. Wet or unstable soil conditions in the trench.

b. Compliance would require maintaining barricades and walkway around and across an open trench in a heavily travelled area which would require continuous surveillance to insure safe operating conditions or the safety of passerby.

c. Maintaining an open trench would unduly delay the completion of the contract.

d. An unforeseeable cause which would result in excess cost.

The Contractor may request the waiver, setting forth the reasons for the request and stating the alternative procedure proposed to comply with the required hydrostatic tests. Backfill placed prior to the tests shall be placed in accordance with the requirements of SECTION: EXCAVATION, TRENCHING, AND BACKFILLING FOR WATER LINES. Piping and specials requiring replacement or repair, as disclosed by hydrostatic tests, and all work connected therewith, shall be at the Contractor's expense.

7.2 LEAKAGE TEST. Leakage test shall be conducted after the pressure tests have been satisfactorily completed. The duration of each leakage test shall be at least 2 hours, and during the test the water line shall be subjected to a pressure of 200 psi. Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved or approved section thereof, necessary to maintain the specified leakage test pressure after the pipe has been filled with water and the air expelled. No piping installation will be accepted until the leakage test is less than the number of gallons per hour as determined by this formula:

$$L = .000135NDX$$

In which L equals the allowable leakage in gallons per hour; N is the number of joints in the length of pipeline tested; D is the nominal diameter of the pipe in inches; and X is the square root of the average test pressure during the leakage test, in psig. Should any test of pipe disclose leakage greater than that specified, the defective joints shall be located and repaired until the leakage is within the specified allowance, without additional cost to the Government.

7.3 TIME FOR MAKING TEST. Except for joint material setting or where concrete reaction backing necessitates a delay, pipelines jointed with rubber gaskets, mechanical or push-on joints, or couplings may be subjected to hydrostatic pressure, inspected, and tested for leakage at any time after partial completion of backfill.

7.4 CONCURRENT HYDROSTATIC TESTS. The Contractor may elect to conduct the hydrostatic tests using either or both of the following procedures. Regardless of the sequence of tests employed, the results of pressure tests, leakage tests, and disinfection shall be satisfactory as specified. All replacement, repair, or retesting required shall be accomplished by the Contractor at no additional cost to the Government.

7.4.1 Pressure Test and Leakage Test may be conducted concurrently.

7.4.2 Hydrostatic Tests and Disinfection may be conducted concurrently, using the water treated for disinfection to accomplish the hydrostatic tests. If the water is lost when treating for disinfection and air is admitted to the unit being tested, or if any repair procedure results in contamination of the unit, disinfection shall be repeated.

8. DISINFECTION. Before acceptance of potable water operation, each unit of completed water line shall be disinfected in accordance with the requirements of AWWA C601 and the Virginia Department of Health. After pressure tests have been made, the unit to be disinfected shall be thoroughly flushed with water until all entrained dirt and mud have been removed before introducing the chlorinating material. The chlorinating material shall be either liquid chlorine in solution, calcium hypochlorite, or sodium hypochlorite, conforming to paragraph: MATERIALS. The chlorinating material shall provide a dosage of not less than 50 milligrams per liter (mg/l) and shall be introduced into the water lines in an approved manner. All pipelines shall be chlorinated using only the above specified chlorinating material in solution. In no case will the agent be introduced into the line in a dry/solid state. The treated water shall be retained in the pipe long

enough to destroy all nonspore-forming bacteria. Except where a shorter period is approved, the retention time shall be at least 24 hours and shall produce not less than 10 mg/l of chlorine throughout the line at the end of the retention period. All valves on the lines being disinfected shall be opened and closed several times during the contact period. The line shall then be flushed with clean water until the residual chlorine is reduced to less than 1.0 mg/l. During the flushing period, each fire hydrant on the line shall be opened and closed several times. From several points in the unit, the Contracting Officer will take samples of water in proper sterilized containers for bacterial examination. The disinfection shall be repeated until tests indicate the absence of bacteriological contamination for at least 2 full days. The unit will not be accepted or put into service until satisfactory bacteriological results have been obtained. All bacteriological examinations shall be made by a commercial laboratory selected by the Contractor and approved by the Contracting Officer.

9. CLEANUP. Upon completion of the installation and testing of the water and service lines and appurtenances, all debris and surplus materials resulting from the work shall be removed.

TABLE I. SIZE OF CORPORATION STOPS AND OUTLETS

Pipe Size Inches	Corporation Stops, Inches For Ductile-Iron	Outlets w/Service Clamps, Inches Single & Double Strap
6	1-1/4	1-1/2
8	1-1/2	2
10	1-1/2	2
12 & larger	2	2

SECTION 2E
STABILIZED AGGREGATE BASE COURSE

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARD.

D 1556-82 Density of Soil in Place by the Sand-Cone Method

1.2 VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION.

Road and Bridge Specifications, 1982 (Basic Designation: VDH & T)

2. DEGREE OF COMPACTION. Stabilized aggregate base course material shall be compacted to not less than 100 per cent of the maximum density as defined by test procedures in D 1556.

3. MATERIALS. Stabilized aggregate base course material shall conform to the requirements of VDH & T Section 205, Size 5.

4. APPROVAL, SAMPLING AND TESTING. Sampling and testing shall be the responsibility of the Contractor, and shall be performed at no additional cost to the Government. Sampling and testing shall be performed by an approved commercial testing laboratory, or by the Contractor subject to approval. Maximum density and optimum moisture shall be determined in accordance with D 1556. Field density shall be determined at such frequency as the Contracting Officer may direct, in accordance with the requirements of ASTM D 1556.

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5. EQUIPMENT. Equipment shall be subject to the approval of the Contracting Officer.

6. WEATHER LIMITATIONS. Base course shall be constructed only when the ambient temperature is above 35 degrees F. When the temperature falls below 35 degrees F, the Contractor shall protect, by approved methods, all areas of completed or partly completed base course from freezing.

7. PREPARATION OF SUBGRADE. Prior to constructing base course, the previously constructed subgrade shall be cleaned of all foreign or objectionable materials. The subgrade shall conform to the requirements of section: "Excavation, Filling and Backfilling for Building". No base course material shall be placed until approved by the Contracting Officer.

8. GRADE CONTROL. During construction, the lines and grades shown shall be maintained by means of line and grade stakes placed by the Contractor.

9. MIXING AND PLACING MATERIALS. Base course materials shall be mixed and placed in accordance with VDH & T section 309.

10. SMOOTHNESS. The surface of the finished base course shall be such that it shows no deviations in excess of 3/8 inch when tested with a 10 foot straightedge applied both at right angles and parallel to the centerline of the base course area. Deviations in excess of this amount shall be corrected by removing material and replacing with new material, or by reworking existing material and recompacting.

11. MAINTENANCE. Base course shall be maintained in a satisfactory condition until accepted. Areas damaged by freezing, rain, traffic or weather conditions shall be corrected to meet specified requirements.

ZERO ACCIDENTS

SECTION 2F

BITUMINOUS SURFACE COURSE (CENTRAL PLANT HOT MIX)

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION.

Road and Bridge Specifications (1982) (Basic designation: VDH & T)

2. MATERIALS shall conform to the requirements of VDH & T, section 212, type S-2 or S-3, and section 312.02, bituminous concrete.

3. SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit data as specified.

3.1 CATEGORY I. None

3.2 CATEGORY II. Certification of compliance for the material specified.

4. MACHINES, EQUIPMENT AND TOOLS shall be as approved by the Contracting Officer.

5. WEATHER LIMITATIONS. Surfaceand intermediate course shall be constructed only when the underlying course is dry and the weather is not rainy. Unless otherwise directed, no material shall be placed when the temperature of the surface to receive the material is below 40 degrees F.

6. PREPARATION OF BASE COURSE. No bituminous material shall be placed until the Contracting Officer has approved the underlying course and all defects therein have been corrected.

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7. GRADE CONTROL. The lines and grades shown on the drawings shall be established and maintained by means of line and grade stakes placed by the Contractor.

8. TRANSPORTATION OF MATERIAL The bituminous mixture shall be transported to the site in such a manner as to ensure delivery at proper temperatures for placing and compaction. Delivery shall be such as to permit as much of the placing as possible to be one in one day. Loads that have been wetted by rain, or have become cold or have crusts of unworkable material will not be acceptable.

9. PLACING. Prior to placing of surface and intermediate course, the underlying course shall be cleaned of all objectionable material, debris, trash and other foreign matter by power blowers, brooms or other approved methods. No material shall be placed until the Contracting Officer has approved the underlying course for this purpose, and the tack or prime coat applied as specified in section: "Bituminous Tack Coat". Placing shall be in accordance with VDH & T, section 320.

10. COMPACTION shall be in accordance with VDH & T, section 320.

11. JOINTS shall be constructed in accordance with VDH & T, section 320, and shall be kept to a minimum.

12. SURFACE REQUIREMENTS. Upon completion of final rolling, the surface shall not vary more than 1/8 inch when tested with a 10 foot straightedge laid both parallel to and at 90 degrees to the centerline of the pavement. Surface irregularities exceeding this tolerance shall be corrected as directed.

ZERO ACCIDENTS

SECTION 2G
BITUMINOUS TACK COAT

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 977-80	Emulsified Asphalt
D 2028-76	Cutback Asphalt (Rapid-Curing Type)
D 2397-79	Cationic Emulsified Asphalt

2. BITUMINOUS MATERIAL shall be cutback asphalt conforming to the requirements of ASTM D 2028, designation RC70 or RC250, or emulsified asphalt conforming to the requirements of ASTM D 977 or ASTM D 2397 designation SS-1 or SS-1h.

3. QUANTITIES TO BE APPLIED. Bituminous material for the tack coat shall be applied in quantities of not less than 0.05 gallon nor more than 0.15 gallon per square yard of surface. The exact quantities may be adjusted to suit field conditions, as approved by the Contracting Officer.

4. EQUIPMENT, TOOLS AND MACHINES shall be as approved by the Contracting Officer.

5. WEATHER LIMITATIONS. The tack coat shall be applied only when the base course is dry, and when the ambient temperature is 50 degrees F or higher, and when the temperature has not been below 35 degrees F for 12 hours immediately prior to application, unless otherwise directed.

6. PREPARATION OF SURFACE. Immediately prior to applying tack coat, the surface to receive tack coat shall be cleaned of all

loose material, trash, debris and other objectionable material to the satisfaction of the Contracting Officer.

7. APPLICATION OF BITUMINOUS MATERIAL. Immediately following the preparation of the surface, the bituminous material shall be applied by standard construction methods subject to the approval of the Contracting Officer.

8. SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit data as specified.

8.1 CATEGORY I. None

8.2 CATEGORY II. Certification of compliance for the material specified.

ZERO ACCIDENTS

SECTION 2H
BITUMINOUS PRIME COAT

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 2027-76 (R 1981) Cutback Asphalt (Medium-Curing Type)

D 2397-79 Cationic Emulsified Asphalt

2. BITUMINOUS MATERIALS shall be liquid asphalt conforming to ASTM Standard D 2027, designation MC-30 or MC-70 at the Contractor's option, except that only MC-30 shall be used on dense-graded base course material if MC-70 does not adequately penetrate the base course material, or emulsified asphalt conforming to ASTM D 2397.

3. QUANTITIES TO BE APPLIED. Bituminous prime coat material shall be applied in quantities of not less than 0.15 gallon nor more than 0.40 gallon per square yard of base course. The exact quantities may be varied to suit field conditions.

4. EQUIPMENT, TOOLS AND MACHINES shall be as approved by the Contracting Officer.

5. WEATHER LIMITATIONS. The prime coat shall be applied only when the base course is dry or contains moisture in excess of that amount which will permit uniform distribution and the desired penetration. The prime coat shall be applied only when the ambient temperature is 50 degrees F or above, and when the temperature has not been below 35 degrees F for 12 hours immediately prior to application, unless otherwise directed.

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6. PREPARATION OF SURFACE. Immediately before applying prime coat material, the surface to receive prime coat shall be cleaned of all objectionable material, trash and contamination to the satisfaction of the Contracting Officer.

7. APPLICATION OF BITUMINOUS MATERIAL. The Contractor shall apply prime coat material using standard construction procedures, subject to the approval of the Contracting Officer.

8. SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit data as specified herein on the following:

8.1 CATEGORY I. None

8.2 CATEGORY II. Certification of compliance for the material specified.

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ZERO ACCIDENTS

SECTION 2J
PRECAST CONCRETE WHEEL STOPS

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 AMERICAN CONCRETE INSTITUTE (ACI) PUBLICATION.

ACI 318-77 (1980 Suppl.)	Building Code Requirements for Reinforced Concrete, with Commentary

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

A 615-82	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
C 33-82	Concrete Aggregates
C 150-81	Portland Cement
C 231-82	Air Content of Freshly Mixed Concrete by the Pressure Method

2. MATERIALS.

2.1 CONCRETE shall be proportioned and mixed to produce a minimum compressive strength of 4,000 p.s.i. at 28 days. Mixing, forming, curing and proportioning shall conform to the applicable portions of ACI 318. An air-entraining admixture shall be batched in the mixture in proper proportions to produce an air content of from 3 to 6 per cent by volume of the concrete, when determined in accordance with the requirements of ASTM Standard C 231.

2.2 PORTLAND CEMENT shall conform to the requirements of ASTM C 150, Type I or II, low alkali.

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2.3 AGGREGATE shall conform to the requirements of ASTM C 33. Maximum size of coarse aggregate shall be 3/4 inch.

2.4 REINFORCING STEEL shall conform to the requirements of ASTM A615, Grade 40 or 60.

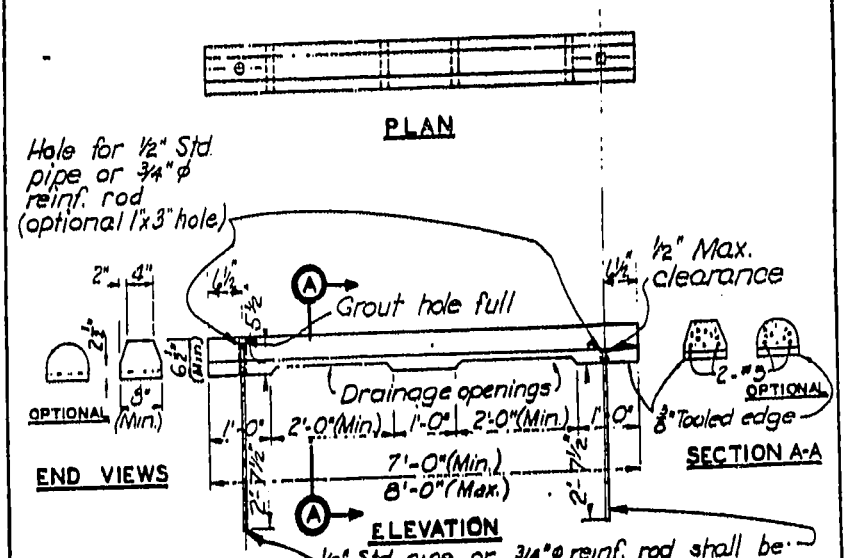
3. INSTALLATION. Precast concrete wheel stops shall be installed at the locations shown. Wheel stops shall have the dimensions shown on Standard Drawing No. 40-17-01, Sheet 7.

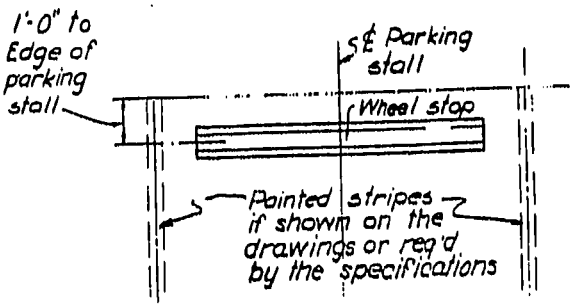
4. SUBMITTALS. In accordance with section: "Special Provisions", the Contractor shall submit for approval data as specified herein on the following:

4.1 CATEGORY I. None.

4.2 CATEGORY II. Certified test results and certificates as listed in the following paragraph.

5. CERTIFIED TEST RESULTS. The Contractor shall submit certified test results showing that concrete materials and mixes conform to all requirements of these specifications.





INSTALLATION PLAN

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NOTE

Minor deviations of a manufacturer's standard product from the cross sections, holes and drainage openings shown are acceptable

PRECAST CONCRETE WHEEL STOP

REVISED NOV 1965

DWG. NO. 40-17-01

SHEET 7

ZERO ACCIDENTS

SECTION 2K
SEEDING AND SODDING

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent indicated by the references thereto. The publications are referred to in the text by the basic designation only.

1.1 VIRGINIA SOIL AND WATER CONSERVATION COMMISSION.

Virginia Erosion and Sediment Control Handbook, Second Edition, Richmond, Virginia, 1980. (Basic designation as used herein: Erosion Control Handbook.)

1.2 VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION.

Road and Bridge Specifications, Richmond, Virginia, July 1, 1982. (Basic designation as used herein: VDH & T.)

2. GENERAL. This section covers seeding and sodding of all soil exposed by construction activities under this contract.

2.1 All slopes equal to 3:1 or steeper shall be sodded.

2.2 All other areas shall be seeded.

3. SEEDING AND SODDING IN PUBLIC RIGHTS-OF-WAY. All areas in public right-of-way disturbed by construction activities under this contract, and not to be paved or riprapped, shall be top-soiled, tilled, limed and fertilized, mulched, and seeded or sodded in accordance with the requirements of VDH & T.

3.1 Seeding mixtures, rates and seeding dates shall be as required in the Erosion Control Handbook, Table 1.66a.

3.2 Sod shall be in accordance with the Erosion Control Handbook, Table 1.67a.

4. SEEDING AND SODDING ON PRIVATE PROPERTY. All areas not in the public right-of-way disturbed by construction activities under this contract, and not to be paved or riprapped, shall be

topsoiled, tilled, limed and fertilized, mulched and seeded or sodded in accordance with the requirements of the Erosion Control Handbook Standard and Specification 1.66, Permanent Seeding, and Standard and Specification 1.67, Sodding.

4.1 Seeding mixtures, rates, and seeding dates shall be as required in the Erosion Control Handbook, Table 1.66a.

4.2 Sod shall be in accordance with the Erosion Control Handbook, Table 1.67a.

5. SUBMITTALS. In accordance with section "Special Provisions", the Contractor shall submit affidavits for seed and fertilizer as required by VDH & T, Section 257.

ZERO ACCIDENTS

SECTION 2L

WATER STORAGE TANK

INDEX

1. APPLICABLE PUBLICATIONS. The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic reference only.

1.1 AMERICAN WATER WORKS ASSOCIATION (AWWA) STANDARD SPECIFICATIONS.

D-100-79	Welded Steel Tanks for Water Storage
D-102-78	Painting Steel Water Storage Tanks

2. GENERAL.

2.1 The Contractor shall furnish all plant, labor, equipment and materials and shall perform all operations necessary for the installation, testing, painting and disinfection of the water storage tank and valve pit. The storage tank shall be designed, fabricated and erected by an approved firm having not less than ten years of experience in this type of work, prior to the date of the invitation for bids.

2.2 WORK SPECIFIED ELSEWHERE. Concrete for foundations not specified below shall be as specified in section: "Concrete".

3. MATERIALS AND EQUIPMENT shall be as specified below and as shown, and shall be suitable for the service intended. Materials and equipment shall be new and unused, except for tests.

3.1 STANDARD PRODUCTS. Material and equipment may at the Contractor's option be the standard products of a manufacturer of such products but shall in any event essentially duplicate equipment that has been in satisfactory service in waterworks operations at least two years prior to bid opening, except as specified above.

3.2 WATER STORAGE TANK shall be of a design standard with the fabricator, welded steel or glass coated bolted in place, as approved by the Contracting Officer and conforming to AWWA D 100, or equivalent. Interior supports shall not be used.

3.2.1 The water sorage tank shall be designed for the following loads:

Roof live load: 40 p.s.f.
Roof dead load: Actual
Wind load: as resulting from a wind speed of 80 m.p.h. on vertical surfaces
Earthquake zone: 1
Allowable soil bearing pressure: 2,500 p.s.f.

3.3 FITTINGS AND PIPING shall conform to the requirements of Section: Water Line.

3.4 ACCESSORIES: The water storage tank shall be provided with the following accessories:

24 inch diameter screened roof vent
24 inch diameter access manhole, located in roof, above the overflow level, with solid watertight shoebox cover hinged at one side, with locking device and compressible rubber gasket which shall provide a continuous seal around the manhole between the lip of the manhole cover and the manhole trunk
Outside steel ladder and cage on shell of tank from roof to a point 8 feet above grade
6 inch diameter screened overflow pipe carried externally from roof to ground. The intake shall have a capacity of 700 gallons per minute with a water level not more than 6 inches above the weir.
One 10 inch diameter inlet-outlet opening
Two 24 inch diameter manholes in the bottom ring of the shell
One 6 inch drain and 6 inch gate valve, including all fittings and pipe
Exterior tank level indicator to register over the range indicated on the drawings. Cable penetrations shall be suitably screened.

3.4 CONTRACT DRAWINGS for the water storage tank are general and may be modified as required for the installation of the equipment furnished. If any departures from the contract drawings are deemed necessary by the Contractor, details of such proposed departures and the reasons therefor shall be submitted in writing for approval as soon as practicable. Such departures shall be made only after written approval by the Contracting Officer, and at no additional cost to the Government.

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4. SUBMITTALS. In accordance with section: "Special Provisions", the Contractor shall submit for approval items as specified herein on the following:

4.1 CATEGORY I.

Water Storage Tank fabrication and erection drawings
Pipe and fittings
Accessories
Welding
Reinforcing bar details and placement drawings
Certification that welded water storage tank design, if used, conforms to the requirements and recommendations of AWWA D100, or in case a bolted steel tank design is used, that the design will result in the construction of a water storage tank equivalent to one meeting the requirements and recommendations of AWWA D100.
Certification that the paint materials and methods of application conform to the requirements of the Virginia Department of Health and of Roanoke County

5. WORKMANSHIP. Materials and equipment shall be installed to conform with the contract documents, in accordance with the approved recommendations of the fabricator or manufacturer. The installation shall be accomplished by workers skilled in the type of work required under this section of the specifications.

5.1 WELDS shall be made by certified welders and shall be inspected by a certified welding inspection laboratory approved by the Contracting Officer.

5.2 PAINTING will be required if glass-coated bolted steel construction is not employed.

5.2.1 All painting and materials shall be in accordance with AWWA D102-78 and Virginia Department of Health and Roanoke County standards. All steel shall be thoroughly cleaned of rust, mill scale, slag, dirt, weld slag and other foreign substances by grit blasting in conformance with SSPC-SP10. All painting materials shall be applied in strict accordance with the printed instructions of the manufacturer of the product involved.

5.2.1.1 A prime coat of epoxy red oxide zinc chromate primer approved by the Contracting Officer shall be applied to all interior surfaces, with a resulting dry film thickness of not less than 1.5 mils.

5.2.1.2 A prime coat of inhibitive primer approved by the Contracting Officer shall be applied to all exterior

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surfaces, with a resulting dry film thickness of not less than 1.5 mils.

5.2.1.3 All interior and exterior surfaces shall receive two finish coats of paint, as follows:

Interior Surfaces:

First Coat: Epoxy brown oxide zinc chromate intermediate paint approved by the Contracting Officer, finished dry film thickness not less than 1.5 mils.

Second Coat: Epoxy aluminum approved by the Contracting Officer, finished dry film thickness not less than 2.0 mils.

Exterior Surfaces:

First Coat: Alkyd intermediate coat approved by the Contracting Officer, finished dry film thickness not less than 1.5 mils.

Second Coat: Aluminum pain approved by the Contracting Officer, finished dry film thickness not less than 1.0 mil. Color selection will be made by the Contracting Officer.

5.2.1.4 All exterior surfaces shall have a total dry film thickness of not less than 4.0 mils.

5.2.1.5 The interior coating shall be allowed to dry not less than five days before the tank is filled with water.

6. CONCRETE FOUNDATIONS. Concrete for foundations shall be as specified in section: "Concrete".

7. TESTING AND DISINFECTION shall be in accordance with Virginia Department of Health standard methods and as specified in Section: Water Line.

ZERO ACCIDENTS

SECTION 3A
CONCRETE

INDEX

1. APPLICABLE PUBLICATIONS. The following publications form a part of this specification to the extent referenced. Reference in the text is by basic designation only.

1.1 VIRGINIA DEPARTMENT OF HIGHWAYS AND TRANSPORTATION.

Road and Bridge Specifications (1982) (Basic designation: VDH & T)

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 1752-67 (R 1978) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

2. GENERAL REQUIREMENTS. Unless otherwise specified or directed, all concrete shall be air entrained concrete in accordance with VDH & T, and the Contractor shall comply with all requirements specified therein for placing, transporting and curing concrete.

3. SUBMITTALS.

3.1 Category I.

3.1.1 The Contractor shall submit certification that all materials specified herein meet the requirements of VDH & T for the classes, types and strengths of concrete specified.

3.1.2 Reinforcement bar details and placement drawings.

4. MATERIALS shall be in accordance with VDH & T, sections 216, 217, 218 and 219, and ASTM D 1752-67.

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5. CONCRETE STRENGTH shall be as specified or shown, and shall have a 28 day compressive strength of not less than 3,000 p.s.i. unless otherwise indicated or specified. Should any section of concrete fail to meet the strength requirement shown or specified, a second test shall be made, and should this test not show that the concrete has reached the required strength, the entire pour from which the sample was taken shall be removed and replaced with fresh concrete until the proper strength is achieved.

6. SAMPLING AND TESTING shall be in accordance with VDH & T, section 219.

7. CONCRETE FINISH. Vertical surfaces which will be exposed to view after the completion of construction shall have rubbed finish. Floor slab and ramp shall have broom finish.

8. PREMOLDED EXPANSION JOINT shall be in accordance with ASTM D 1752-67.

9. PERIMETER INSULATION. Perimeter insulation shall be applied with adhesive to the interior surface of foundation walls, extending from the underside of the slab to the depth indicated.

10. VAPOR BARRIER. Immediately before placing concrete, the capillary water barrier or subgrade under slabs in buildings shall be covered with a vapor barrier unless membrane waterproofing is indicated. Punctures and tears during subsequent operations shall be patched. Edges shall be lapped not less than 4 inches and ends not less than 6 inches. Patches and lapped joints shall be sealed with a pressure-sensitive adhesive or pressure-sensitive tape, not less than 2 inches wide and compatible with the membrane.

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ZERO ACCIDENTS

SECTION 4A
MASONRY

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

A 153-82	Zinc Coating (Hot Dip) on Iron and Steel Hardware
A 615-82	Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A 616-82a	Rail-Steel Deformed and Plain Bars for Concrete Reinforcement
B 227-70 (R 1980)	Hard-Drawn Copper-Clad Steel Wire
C 62-81	Building Brick (Solid Masonry Units Made from Clay or Shale)
C 67-81	Sampling and Testing Brick and Structural Clay Tile
C 270-82	Mortar for Unit Masonry
C 476-80	Grout for Reinforced and Nonreinforced Masonry
C 952-76	Bond Strength of Mortar to Masonry Units

1.2 INTERNATIONAL MASONRY INDUSTRY ALL-WEATHER COUNCIL (IMIAWC) PUBLICATIONS.

Recommended Practices and Guide Specifications for Cold Weather Masonry Construction (Dec. 1, 1970; Sixth Printing, July 7, 1977) (Basic designation: IMIAWC.)

2. SUBMITTALS. In accordance with section: "Special Provisions", the Contractor shall submit data as specified herein on the following:

2.1 CATEGORY I.

2.1.1 Descriptive data for insulation, including U-value computations, shall be submitted for approval.

2.2 CATEGORY II.

2.2.1 Descriptive data shall be submitted for approval for brick.

2.2.2 Samples shall be submitted for approval for concrete masonry units and brick - shapes, sizes and kinds in sufficient number to show full range of color and texture.

2.2.3 Certificates of Compliance shall be submitted for concrete masonry units and brick, stating that the materials conform to the specified requirements.

2.2.4 Test Reports. Certified copies of test reports, including all test data, shall be submitted in accordance with paragraph: "Sampling and Testing".

3. HANDLING AND STORAGE. Materials shall be handled, stored and protected in an approved manner to prevent chipping, breakage, contact with soil or contaminating material, and exposure to the elements. Concrete masonry units shall conform to the moisture content specified in ASTM C 90 and ASTM C 145 when delivered to the job site. Anchors, tie bars and joint reinforcement shall be kept free of rust. Steel reinforcing bars or rods shall be free of loose scale and rust. Prefabricated lintel shall be marked on the top to show the number and size of top and bottom bars.

4. ENVIRONMENTAL REQUIREMENTS.

4.1 HOT-WEATHER INSTALLATION. Masonry erected when the ambient air temperature is over 99 degrees F in the shade, and the relative humidity is less than 50 percent, shall be protected from direct exposure to wind and sun for 48 hours after installation.

4.2 COLD-WEATHER INSTALLATION shall be in accordance with IMIAWC.

5. SAMPLING AND TESTING shall be the responsibility of the Contractor and shall be performed at no additional cost to the Government. Sampling and testing shall be performed by an approved commercial testing laboratory. Tests shall be performed in sufficient number to ensure that materials meet the specified requirements. Copies of laboratory test reports, including all test data, shall be submitted at least 10 days before delivery of the unit, mortar materials, or mortar admixtures represented by the tests to the site. Unless otherwise specified or directed, tests shall not be required; the Contractor may submit certifications of compliance with this specification from each manufacturer for each batch of material.

6. MATERIALS shall conform to the respective specifications and other requirements specified below.

6.1 ANCHORS, TIES AND JOINT REINFORCEMENT shall be types as specified below and, except as otherwise specified, shall be zinc-coated ferrous metal. Zinc coat shall conform to ASTM A 153. Copper cladding of steel wire shall comply with the requirements specified for grade 30 HS wire in ASTM B 227.

6.1.1 Wire-Mesh Ties. One half inch mesh of minimum 16 gage steel wire. Ties for anchoring brick facing to masonry backup shall be 3 inches wide and shall be of a length to extend within 1/2 inch of the outermost face of the facing and masonry backup.

6.1.2 Composite-Wall Ties. Rectangular-shaped, not less than 2 inches wide by 6 inches long, made of 3/16-inch diameter, zinc-coated or copper-clad steel wire, without drip; or may be continuous type conforming to paragraph: JOINT REINFORCEMENT

6.2 CLAY OR SHALE BRICK. ASTM C 62 conforming to approved sample, Grade SW. Brick shall be tested for efflorescence, modular size shall be 4" x 4" x 8".

6.3 CONCRETE MASONRY UNITS. ASTM C 90, Type I, Grade N-1. The maximum linear drying shrinkage shall be 0.030 percent for units with a concrete density of 120 lb. per cubic foot or more, and 0.040 percent for units with a concrete density less than 120 lb. per cubic foot. Units shall include closer, jamb, header, lintel and bond beam units and all special shapes and sizes equired to complete the work indicated.

6.4 MORTAR for all masonry shall comply with the property specification for type S mortar in accordance with ASTM C 270 and as modified herein, proportioned and tested in the laboratory. When tested for water retention, the mortar shall have a flow, after suction, of 75 percent or more when mixed to an initial flow of 125 to 140 percent. When tested for compressive strength, mortar shall be mixed to a flow of 100 to 115 percent.

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6.5 LINTEL shall be a factory-made unit from a plant regularly engaged in the manufacture of precast concrete units, and unless otherwise indicated or specified shall conform to the requirements for 3,000 p.s.i. concrete as specified in section: "Concrete". Lintel shall have two No. 4 reinforcing bars each, top and bottom, running the full length of the lintel.

6.6 REINFORCING BARS AND RODS shall conform to ASTM A 615 or ASTM A 616.

7. PROTECTION. Facing materials shall be protected against staining. Top of walls shall be covered with nonstaining waterproof covering or membrane when work is not in progress. Covering shall extend down a minimum of 2 feet on each side of the wall, and shall beheld securely in place. Before starting or resuming, top surface of masonry in place shall be cleaned of loose mortar and foreign material.

8. ERECTION.

8.1 GENERAL. Both inner and outer wythes shall be laid up together. No unit having a film of water or frost on its surface shall be laid. Cutting of individual masonry units shall be with power masonry saw. Masonry shall be laid plumb, true to line, with level courses accurately spaced. Bond pattern shall be kept plumb throughout. Corners and reveals shall be plumb and true. Vertic1 joints shall be shoved tight. Each unit shall be adjusted to final position while mortar is still soft and plastic. Any unit that is disturbed after mortar has stiffened shall be removed and relaid with fresh mortar. Courses shall be so laid that backing masonry will level off flush with the face work at all joints where ties occur. Raked out joints shall be kept free of mortar and other debris. The sizes of any two adjacent units shall be within permitted tolerances so that the difference between the vertical faces of such units shall not exceed 1/8 inch in exposed-to-view or painted walls. Units in such positions shall be free from chipped edges or other imperfections detracting from the appearance of the finished work.

8.2 CUTTING AND FITTING, including that required for the work of other trades, shall be done by masonry mechanics. Wherever possible, full units of the proper size shall be used in lieu of cut units. Cut edges shall be clean, true and sharp. Cutting of units shall be with power masonry saw for exposed block. Masonry hammer and chisel will be permitted for unexposed block work. Openings shall be carefully cut, formed or otherwise neatly made for electrical or other installations so that such work can be properly and neatly completed. Webs shall be cut the minimum required for proper installation. Reinforcd masonry

lintels shall be provided above openings over 12 inches wide for pipe and ducts, unless steel sleeves are used.

8.3 EMBEDDED ITEMS. Spaces around metal door frame and other built-in items shall be filled solidly with mortar. Anchors, ties, wall plugs, accessories, flashings, pipe sleeves and other items required to be built in shall be built in as the masonry work progresses. Anchors, ties and joint reinforcement shall be fully embedded in mortar. Cells receiving anchor bolts and cells of first masonry course below bearing plates shall be filled solidly with grout.

8.4 MORTAR MATERIALS shall be accurately measured in laboratory-established proportions and mixed with as much water as may be necessary to produce the wettest workable consistency possible. Mortar shall be placed in final position within 2-1/2 hours after mixing. Mortar not used or that has started to set within this time interval shall be discarded. Mortar that has stiffened within the above time interval, because of evaporation or moisture from the mortar, shall be retempered to restore its workability.

8.5 JOINTING. Joints shall be tooled slightly concave with the mortar thoroughly compacted and pressed against the edges of the units. Tooling shall be done when the mortar is thumbprint hard. The tooled joints shall be finished to uniformly straight and true lines and surfaces, smooth, and free of tool marks.

8.5.1 Joint Widths for concrete masonry units shall be approximately 3/8 inch. Joint widths for brick facing shall be of thickness equal to the differnce between the actual and nominal dimensions of the brick in either height or length, but in no case shall the average width of any three adjacent joints be less than 1/4 nor more than 1/2 inch. Vertical joints shall be of the same width except for inconspicuous variations required to maintain bond.

8.6 CLAY OR SHALE BRICK having an initial rate of absorption of more than 0.025 ounce per minute per square inch of bed surface, determined in conformance with ASTM C 67, shall be wetted in such a manner that each unit is nearly saturated, surface dry when laid. Molded brick shall be laid with the frog side down. Brick that is cored, recessed, or has other deformations shall not be used where deformations will be exposed to view. Horizontal, vertical and collar joints shall be completely filled with mortar when laid.

8.6.1 Brick Facing shall be laid with the better face of the brick exposed. Unless otherwise indicated, brick shall be laid in running bond with each course masonry bonded at corners.

8.6.2 Composite Walls. Brick facing shall be anchored or tied to masonry backup with continuous joint reinforcement at intervals not exceeding 16 inches vertically. Reinforcement shall be installed with two wires in masonry backup. Brick facing may be tied to masonry backup with wire mesh or composite wall ties spaced not more than 32 inches on centers horizontally, in courses not over 16 inches apart vertically, staggered in alternate courses. Composite wall or wire mesh ties shall be laid within 1/2 inch of the exposed surface of the facing joint and with other ends centered over webs or vertical joints in backup.

8.7 CONCRETE MASONRY UNITS and concrete brick shall not be wetted before laying. Units shall be laid in running bond so the vertical joints between units will be located over the center of the units in the next course below and in alignment from top to bottom of the wall. Units shall be full bedded in mortar under both face shells and webs. All head joints shall be filled solidly with mortar for a distance in from the face of the unit or well not less than the thickness of the longitudinal face shell. Jamb units shall be of the shapes and sizes to bond with wall units. No cells shall be left open in the face surfaces. Sections of brickwork shall be incorporated in the masonry work where necessary to fill out at corners and elsewhere as required.

8.7.1 Mortar, Grout or Concrete Fill. Small-mesh wire fabric or expanded metal shall be embedded in mortar below cells of hollow units receiving mortar, grout or concrete fill. Hollow masonry units in walls supporting plumbing, heating or other mechanical fixtures, voids at door jambs, and other spaces requiring fill shall be filled solid with grout, mortar or concrete. Cells under lintel bearings on each side of openings shall be filled solid with grout, mortar or concrete for full height of openings. One cell of two-cell units and two cells of three-cell units shall be filled on each side of jambs when lintel bearings are 8 inches. Solid units may be used instead of hollow units filled with grout, mortar or concrete, except for installations requiring embedment of anchors in cells of hollow units. Cells containing reinforcing bars shall be filled with grout.

8.7.2 Lintels. When constructed of concrete masonry units, lintels shall be specially formed load bearing lintel or U-shaped units filled solid with grout or with 3,000 p.s.i. concrete in conformance with section: "Concrete", using coarse aggregate of 1/2 to No. 4 nominal size, and reinforced. Lintels shall extend at least 8 inches beyond each side of openings.

9. SHRINKAGE-CRACKING CONTROL shall be controlled by bond beams and joint reinforcement as hereinafter specified.

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9.1 BOND BEAMS shall consist of load-bearing units filled with grout or 3,000 p.s.i. concrete in conformance with section: "Concrete", using coarse aggregate of 1/2 to No. 4 size, and reinforced as indicated. No. 4 wire mesh or small-mesh or small-mesh expanded metal lath shall be embedded in mortar joints receiving open-bottom bond beam units to retain the concrete fill. Reinforcement shall be continuous. Where splices are required for continuity, reinforcement shall be lapped 24 bar diameters or 12 inches, whichever is greater. A minimum clearance of 1/4 inch shall be maintained between reinforcement and interior faces of units. Concrete fill shall be placed in conformance with section: "Concrete".

10. POINTING AND CLEANING. Mortar daubs or splashings, before setting or hardening, shall be completely removed from masonry-unit surfaces to be exposed or painted. Before completion of the work, all defects in masonry joints to be exposed or painted shall be raked out as necessary, filled with mortar, and tooled to match existing joints. Masonry surfaces shall not be cleaned, other than removing excess surface mortar, until mortar in joints has hardened. Masonry surfaces shall be left clean, free of mortar daubs, dirt, stain, and discoloration, including scum from cleaning operations, and with tight mortar joints throughout. Metal tools and metal brushes shall not be used for cleaning.

10.1 CONCRETE MASONRY UNIT AND CONCRETE BRICK SURFACES shall be dry-brushed at the end of each day's work and after any required pointing.

10.2 CLAY OR SHALE BRICK SURFACES. Before cleaning, the method of cleaning shall be submitted to the Contracting Officer for approval. The exposed masonry shall be water-soaked and then cleaned with a solution proportioned 1/2 cup trisodium phosphae and 1/2 cup household detergent to 1 gallon of water. The solution shall be applied with stiff-fiber brushes, followed immediately by rinsing with clean water. Surfaces of dark colored brick still showing stain or discoloration and that are not subject to green efflorescence shall be cleaned with a 6 percent solution of commercial muriatic acid applied with stiff fiber brushes to not more than 10 square feet of water-soaked wall at a time, immediately followed by thorough rinsing with clean water. In lieu of the above cleaning agents, a proprietary masonry cleaning agent recommended by the clay products manufacturer and that will not adversely affect the masonry surfaces may be used, subject to approval. Proprietary cleaning agents shall be used in conformance with the cleaning product manufacturer's printed recommendations and instructions. Green efflorescence shall be removed in conformance with the brick manufacturer's recommendations.

ZERO ACCIDENTS

SECTION 6A
ROUGH CARPENTRY

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 FEDERAL SPECIFICATION.

HH-I-521f Insulation Blankets, Thermal (Mineral Fiber; for Ambient Temperatures)

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 226-82 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

1.3 AMERICAN PLYWOOD ASSOCIATION (APA) PUBLICATION.

Plywood Truss Designs (November 1964)

1.4 TRUSS PLATE INSTITUTE, INC. (TPI) PUBLICATION.

TPI-78 Design Specification for Metal Plate Connected Wood Trusses

2. MATERIAL.

2.1 ROOF TRUSSES shall be standard manufactured wood trusses designed in accordance with the requirements of TPI-78, or in accordance with Plywood Truss Designs, for the following loads: top chord live load, 40 p.s.f.; bottom chord live load, 10 p.s.f.;dead load (all), actual; wind load: as resulting from an 80 m.p.h. wind. The Contractor shall submit the design for the approval of the Contracting Officer.

2.2 PLATES, STUDS AND OTHER WOOD MEMBERS shall be clear structural grade wood as approved by the Contracting Officer.

2.3 PLYWOOD SHEATHING AND ROOF DECKING shall be exterior plywood, grade C/C, 1/2 inch thick, with 24/0 identification index, as approved by the Contracting Officer.

2.4 MOISTURE BARRIER shall be asphalt-saturated organic felt conforming to D 226-72.

2.5 INSULATION shall be blanket insulation conforming to HH-I-521f.

2.6 OTHER MATERIALS such as nails, screws, bridging and similar material shall be as approved by the Contracting Officer.

3. DELIVERY AND STORAGE. All material delivered under the provisions of this section shall be stored in such manner as will prevent warping, wetting, contact with soil or pavement, and other damage.

4. INSTALLATION of trusses shall be in accordance with the truss manufacturer's printed recommendations and instructions. Plywood sheathing and roof decking shall be installed neatly and true to line, using a minimum number of cuts. Edges of sheets shall butt neatly and tightly without forcing. Bridging for the bottom of the trusses to maintain position for application of gypsum wallboard ceiling shall be as recommended by the truss manufacturer. Fastening of plywood to roof trusses shall be by 6d common nails at 6 inches on centers at all edge supports, or by means of 16 gage x 1-1/2 inches long x 3/8 inch crown width galvanized wire staples at 4 inches on centers at edge supports and at 8 inches on centers at intermediate supports. When all decking and sheathing is in place, the roof and wall sheathing shall be covered with moisture barrier as specified in section: "Roofing".

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ZERO ACCIDENTS

SECTION 6B
FINISH CARPENTRY

INDEX

1. APPLICABLE PUBLICATIONS. The following publication forms a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.

1.1 U.S. DEPARTMENT OF COMMERCE PRODUCT STANDARD.

PS 1-74 Construction and Industrial Plywood

2. MATERIAL.

2.1 SIDING shall be horizontal wood siding, horizontal bevel type, minimum 3/16 inch thick edge by minimum 7/16 inch thick, horizontal drop, maximum practicable lengths, smooth face.

2.2 SOFFITS shall be plywood, 3/8 inch thick, PS 1, Exterior type, grade B-C.

2.3 TRIM AND OTHER MATERIAL shall be as approved by the Contracting Officer.

3. STORAGE AND DELIVERY. All material shall be delivered to the site and stored in such a manner as to prevent wetting, contamination with soil, chemicals or other deleterious matter, and damage.

4. INSTALLATION. siding shall be installed over previously approved moisture barrier, in a neat and workmanlike manner. Nails shall be driven home and true, and the finished siding shall be in all respects ready for painting. Should any part of the siding be damaged during the construction period of this contract, the damage shall be repaired by removal of the damaged siding and replacement with new, undamaged siding at no additional expense to the Government.

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ZERO ACCIDENTS

SECTION 7A
ROOFING, STRIP SHINGLES

INDEX

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 3018-82 Class A Asphalt Shingles Surfaced With Mineral Granules

1.2 UNDERWRITERS LABORATORIES INC. (UL) PUBLICATIONS.

UL 55B Class C Asphalt Organic-Felt Sheet Roofing and Shingles (October 30, 1974; Rev. Thru July 7, 1978)

UL 997 Wind Resistance of Prepared Roof Covering Materials (July 11, 1981, 4th Ed.)

2. DELIVERY AND STORAGE OF MATERIALS: Materials shall be delivered in manufacturer's unopened bundles and containers with the manufacturer's brand and name marked clearly thereon. Shingles shall be stored in accordance with manufacturer's printed directions. Roll goods shall be stored on end in an upright position. Immediately before laying, roofing felt shall be stored for 24 hours in an area maintained at a temperature not lower than 50 degrees F.

PART 2 - PRODUCTS

3. MATERIALS shall conform to the following requirements:

3.1 ASPHALT-SATURATED FELT UNDERLAYMENT. ASTM D 226, Type I.

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3.2 NAILS. In accordance with the manufacturer's printed instructions.

3.3 SHINGLES. Inorganic Mat type shingles conforming to ASTM D 3018, Type I, weighing not less than 255 pounds per 100 square feet, meeting the requirements of UL 55B and UL 997. Shingles shall be approximately 12 by 36 inches in dimension and 3 tab design. Color of shingles shall be as selected by the Contracting Officer from the manufacturer's standard colors.

PART 3 - EXECUTION

4. PREPARATION OF SURFACES. The construction of each section of roof deck shall be completed before roofing work is started. Roof surfaces shall be smooth, firm, dry, and free from loose boards, large cracks, and projecting ends that might damage the roofing. Vents and other projections through the roof shall be properly flashed and secured in position, and projecting nails driven home.

5. APPLICATION OF ROOFING.

5.1 FLASHING. Metal flashing shall conform to section: "Sheet Metalwork, General". Metal flashing shall be provided at projections through the roof.

5.2 METAL DRIP EDGE. Metal drip edges made of noncorrodible, nonstaining metal shall be provided along eaves and rakes. The metal drip edge shall be applied directly over the underlayment along the rakes and directly on the wood deck at the eaves. Metal drip edges shall extend back from the edge of the deck not less than 3 inches and shall be secured with compatible nails spaced not more than 10 inches on center along the inner edge.

5.3 UNDERLAYMENT. Before any shingles are applied, two layers of asphalt-saturated felt underlayment shall be applied to the roof deck. Joints between adjacent strips shall not coincide with underlying strip joints.

5.4 SHINGLES. Shingles shall be applied in accordance with the manufacturer's printed instructions as they appear on the bundle wrapping.

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ZERO ACCIDENTS

SECTION 7B
SHEET METALWORK

INDEX

1. GENERAL. The following general requirements shall apply to all sheet metal work unless otherwise specified or directed.

1.1 FABRICATION. The Contractor shall verify all dimensions and shall take necessary field measurements before fabrication.

1.2 INSTALLATION. Surfaces that are to receive sheet metal shall be even, smooth, sound, thoroughly clean and dry, and free from defects that might affect the application. Runs of sheet metal items shall be furnished and installed in 8 to 10 foot lengths. Multiple lengths of sheet metal shall be joined together using an approved joining method. Cutting, fitting drilling and other work required to accommodate the work of other trades shall be done by sheet metal mechanics. Accessories and other items essential to complete the work, whether specified or not, shall be furnished and installed as though specified herein. All work shall be so executed as to result in a weathertight finished product. Installation of sheet metal in conjunction with roofing shall be coordinated with roofing work to permit continuous roofing operations.

2. MATERIALS. Materials shall be as approved by the Contracting Officer. At the option of the Government, samples submitted as hereinafter specified may be incorporated into the work.

3. SUBMITTALS. In accordance with section: " Special Provisions", the Contractor shall submit for approval, data as specified herein on the following:

3.1 CATEGORY I. None.

3.2 CATEGORY II. Samples:

Covering on minor flat, pitched or curved samples
Louvers
Flashings at roof penetrations

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4. DELIVERY AND STORAGE. All material shall be delivered and stored so as to protect it from wetting, damage, water staining, contact with soil or items which might affect the finish, appearance or function of the work.

5. INSTALLATION. Installation shall be for each item such as to produce a neat, functional and sound result in accordance with standard construction practices.

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ZERO ACCIDENTS

SECTION 7D
CALKING AND SEALANTS

INDEX

ORIGINAL (Red)

1. APPLICABLE PUBLICATION. The following publication forms a part of this specification to the extent referenced. The publication is referred to in the text by basic designation only.

1.1 FEDERAL SPECIFICATION.

TT-C-00598C (COM-NBS)	Calking Compound, Oil and Resin Base Type (For Building Construction)

2. GENERAL REQUIREMENTS. Calking shall be provided in joints as indicated or specified. The joint design, shape and spacing shall be as indicated.

3. SUBMITTALS.

3.1 CATEGORY I. None.

3.2 CATEGORY II.

3.2.1 For Approval.

3.2.1.1 Manufacturers' Descriptive Data.

3.2.1.2 Samples: 2 cartridges or equivalent bulk material.

Samples shall be furnished for each lot. Labels on the sample containers shall contain the same information as required on containers delivered to the job. Each sample shall be positively identified with the corresponding lot of material delivered to the project.

3.2.2 For Information Only. Certificates of compliance stating that the materials conform to the specified requirements.

4. ENVIRONMENTAL REQUIREMENTS. The ambient temperature shall be within the limits of 40 to 90 degrees F when the calking is applied.

5. DELIVERY AND STORAGE. Materials shall be delivered to the job in the manufacturer's original unopened containers. The containers shall include the following information on the label: supplier, name of material, formula or specification number, lot number, color, date of manufacture, shelf life and curing time. Calking compounds outdated as indicated by shelf life shall not be used. Materials shall be carefully handled and stored to prevent inclusion of foreign materials or exposure to temperatures exceeding 90 degrees F.

6. MATERIALS shall conform to TT-C-00598C.

7. SURFACE PREPARATION. The surfaces of the joints to be sealed shall be dry and clean. Oil, grease, dirt, chalk, particles of mortar, dust, loose rust, loose mill scale and other foreign matter shall be removed from all joint surfaces to be calked in accordance with the instructions of the calking manufacturer. Cleaned surfaces shall be wiped down with clean cloths.

8. APPLICATION. Compound shall be gun-applied with a nozzle of proper size to fit the width of the joint indicated, and shall be forced into grooves with sufficient pressure to expel air and fill the groove solidly. Calking shall be uniformly smooth and free of wrinkles and shall be left sufficiently convex to result in a flush joint when dry. One coat of aluminum paint shall be applied over joint when compound has dried sufficiently to develop a surface skin so that painting will not deform the surface of the joint.

9. CLEANING. The surfaces adjoining the calked joints shall be cleaned of smears and other soiling resulting from the calking operation as the work progresses.

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ZERO ACCIDENTS

ORIGINAL (Red)

SECTION 8A
STEEL DOOR AND FRAME

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 DOOR AND HARDWARE INSTITUTE (DHI) PUBLICATION.

The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames, and Builders Hardware (1977)

1.2 STEEL DOOR INSTITUTE (SDI) SPECIFICATION.

100-80 Standard Steel Doors and Frames

2. SUBMITTALS.

2.1 CATEGORY I.

(a) Descriptive data showing assembly, hardware reinforcement and location, frame anchorage, metal thickness, core material, and factory finish.

(b) Descriptive data for louver, threshold, and weatherstripping.

(c) Certification that door and frame comply with all requirements of SDI 100.

2.2 CATEGORY II. None.

3. DELIVERY AND STORAGE. To provide protection during shipment, welded unit type frame shall be provided with temporary steel spreader at the bottom of the frame. Knockdown type frame shall be securely strapped in a bundle. Materials shall be delivered to the site in undamaged condition, and stored out of contact with the ground under a weathertight covering permitting good air circulation. Whenever damage becomes evident, abraded, scarred

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or rusty areas shall be cleaned to bright metal and touched up with the paint used for the shop painting.

4. GENERAL REQUIREMENTS. Door and frame shall be a factory fabricated product conforming to SDI 100 and the additional requirements specified herein. Door and frame shall be prepared to receive hardware conforming to the templates and information provided under section: "Builders' Hardware". The door and frame shall be provided with weatherstripping and threshold.

4.1 DOOR shall be Type III, Extra Heavy Duty, Style 1 or 5, Flush Panel or Full Flush. It shall have a rigid insulation core glued or foamed in place, providing a U value, through the door panel, not greater than 0.10. The top edge of the door shall be closed flush and sealed against water penetration.

4.2 WEATHERSTRIPPING shall be closed cell foam neoprene, 1/8 inch thick, that will remain flexible at -60 degrees F. Neoprene strip shall be mounted in an extruded aluminum or bronze housing, 1-1/4 inches wide. Aluminum housing shall have mill finish and shall be painted to match the door frame. Weatherstripping shall be adjustable by means of slotted holes for screw mounting.

4.2.1 Head and Jamb Weatherstripping shall be mounted on the frame stop. As an option to the above, weatherstripping may be of a type designed to fit into a specially prepared frame, as standard with the frame manufacturer.

4.2.2 Sill weatherstripping shall be installed on the hinge face of the door.

4.3 THRESHOLD shall be extruded aluminum or bronze, flat type with a fluted top, and shall provide proper clearance and an effective seal with the specified weatherstripping. Threshold shall be neatly scribed and fitted to the door frame, and bedded in sealant and anchored with countersunk screws spaced not over 12 inches on center.

4.4 LOUVER shall be automatic-closing type, of the nominal size shown, opening when the emergency generator is running and sufficient negative air pressure is generated to cause it to open, and otherwise remaining closed.

5. INSTALLATION shall conform to DHI publication cited hereinbefore. Door shall be installed in conjunction with applicable hardware. Weatherstripping and threshold shall be installed to provide a weathertight installation.

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SECTION 8B
BUILDERS HARDWARE

INDEX

1. APPLICABLE PUBLICATIONS. The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS.

A156.1-1981 Butts and Hinges

A156.2-1976 Locks and Lock Trim

1.2 DOOR AND HARDWARE INSTITUTE (DHI) PUBLICATIONS.

Recommended Locations for Builders Hardware for Standard Steel Doors and Frames (1975)

2. GENERAL. Hardware shall conform to the applicable requirements of the standards listed herein, unless otherwise specified. Reinforcement for hardware in steel door shall be as specified in section: "Steel Door and Frame".

3. TEMPLATES. The Contractor shall furnish templates or other information necessary to enable the door manufacturer to make proper provision in his work to receive the specified hardware.

4. SUBMITTALS. None.

5. MATERIALS will be as directed by the Contracting Officer.

6. INSTALLATION shall be as recommended by the manufacturer.

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SECTION 9A
GYPSUM WALLBOARD (DRYWALL)

ORIGINAL (Red)

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

C 36-80	Gypsum Wallboard
C 475-82	Joint Treatment Materials for Gypsum Wallboard Construction
C 514-77	Nails for the Application of Gypsum Wallboard
C 840-79	Application and Finishing of Gypsum Board

2. GENERAL REQUIREMENTS. Except where otherwise specified or indicated, the work shall conform to ASTM C 840. Gypsum wallboard shall be applied to the wood framing for the ceiling of the booster station only. Wood framing is specified in section: "Rough Carpentry".

3. DELIVERY AND STORAGE. Wallboard delivered prior to use shall be stored off the ground within a completely enclosed structure or completely enclosed in a weathertight covering. Wallboard shall be dry, free of warpage, and have bundling tape intact immediately prior to use. Application shall commence only after the area scheduled for wallboard installation is completely weathertight and approved.

4. MATERIALS shall conform to the requirements of ASTM C 36, 48 inches wide, with tapered edges for finish ply. Wallboard shall be regular type, 1/2 or 5/8 inch thick at the Contractor's

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option, except that all wallboard shall be the same thickness. Corner bead, taping compound, joint tape, and nails shall conform to ASTM C 475. Miscellaneous items not otherwise specified shall be as recommended by the wallboard manufacturer and approved prior to use. Powder driven fasteners may be used only when approved in writing.

5. APPLICATION OF GYPSUM WALLBOARD. Gypsum wallboard shall be applied to roof truss members in accordance with ASTM C 480 and the requirements specified herein. Gypsum wallboard shall be applied with separate boards in moderate contact without forcing in place. End joints of boards shall be staggered. Abutting end and edge joints shall be neatly fitted. Boards of maximum practical length shall be used. Wallboard shall be cut as required to make neat, close joints around openings. Wallboard may be applied using adhesive/nail-on method in accordance with ASTM C 480, System III, or System I, at the Contractor's option.

6. FINISHING OF GYPSUM WALLBOARD. Gypsum wallboard shall be taped and finished in accordance with ASTM C 840. Joint, fastener depression, and corner treatment shall be provided.

7. PATCHING. Surface defects and damage shall be corrected as required to leave gypsum wallboard smooth, uniform in appearance, and ready to receive paint finish.

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ZERO ACCIDENTS

SECTION 9B
PAINTING

INDEX

1. DEFINITION. The term "paint", as used herein, includes emulsions, enamels, primers, paints, stains, varnishes, sealers, cement-emulsion filler, and other coatings, whether used as prime, intermediate or finish coats.

2. PACKAGING, LABELING AND STORAGE. Paints shall be in sealed containers that clearly show the designated name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings or special precautions, and name of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paint shall be stored on the project site in such a manner as to prevent damage from the elements, contamination or leakage.

3. SUBMITTALS. In accordance with section: "Special Conditions", the Contractor shall submit data as specified herein on the following:

3.1 CATEGORY I. None.

3.2 CATEGORY II. Certificates of compliance shall be submitted for approval attesting that all paints proposed for use contain not more than 0.06 per cent lead as defined in paragraph: "Hazardous Materials Restriction". Submit for approval the proprietary brand names of the materials proposed for use.

4. COLORS AND TINTS shall be as selected by the Contracting Officer from the manufacturer's standard color selection. The

color of the undercoats shall vary slightly from the color of the next coat.

5. ENVIRONMENTAL CONDITIONS. Water-thinned coatings shall be applied only when the ambient temperature is between 50 and 90 degrees F. Other coatings shall be applied only when environmental conditions meet the recommendations of the coating manufacturer.

6. MATERIALS. Materials shall be as specified below and subject to the approval of the Contracting Officer:

Masonry Walls: Modified epoxy-high build sand texture finish having 50 percent minimum solids by volume. Provide one finish coat, 10 mils dry film thickness.

Wallboard and Doors: Two component polyurethane primer with a minimum 2.0 mils dry film thickness, and a polyurethane finish coat with a minimum 1.5 mils dry film thickness.

7. HAZARDOUS MATERIALS RESTRICTION.

7.1 LEAD. Paint shall contain no more than 0.06 per cent lead by weight (calculated as lead metal).

7.2 MERCURY. Mercurial fungicides shall not be used.

8. SURFACE PREPARATION. Items not to be painted which are in contact with or adjacent to surfaces to be painted shall be removed or protected prior to surface preparation and painting operations. Exposed ferrous metals including nails on or in contact with surfaces to be painted with water-thinned paints shall be spot primed with zinc dust, zinc dust-zinc oxide, zinc yellow-iron oxide, or zinc chromate primer. Surfaces to be painted shall be cleaned before applying paint or surface treatments. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity, and shall have flashpoints in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces.

8.1 MASONRY SURFACES shall be allowed to dry at least 30 days prior to painting. All glaze, efflorescence, laitance, dirt, grease, oil, asphalt, surface deposits of free iron and other foreign matter shall be removed prior to painting. Masonry surfaces to be painted shall further be prepared in strict accordance with the printed instructions of the paint manufacturer.

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8.2 FERROUS SURFACES that have not been shop coated shall be solvent cleaned, mechanically cleaned of rust, scale and other matter as directed, and primed in accordance with the printed instructions of the final coating manufacturer.

ORIGINAL (Red)

8.3 GALVANIZED AND NONFERROUS METAL SURFACES shall be solvent cleaned and treated with a vinyl type wash coat.

8.4 GYPSUM WALLBOARD SURFACES shall be dry and have all loose dirt and dust removed by brushing with a soft brush or rubbing with a dry cloth prior to application of the first coat.

9. MIXING AND THINNING shall be in strict accordance with the printed instructions of the paint manufacturer.

10. APPLICATION shall be in strict accordance with the printed instructions of the paint manufacturer.

11. CLEANING. Cloths, cotton waste and other materials that might constitute a fire hazard shall be placed in closed metal containers and removed at the end of each day. Upon completion of the work, staging, scaffolding, and containers shall be removed from the site. Paint and other deposits upon adjacent surfaces shall be removed and the entire job left clean and acceptable.

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ZERO ACCIDENTS

SECTION 11A
CENTRIFUGAL WATER PUMPS

INDEX

1. APPLICABLE PUBLICATIONS. The following publications form a part of this specification to the extent referenced. The publications are referred to in the text by basic reference only.

1.1 FEDERAL SPECIFICATIONS.

GG-G-76E & Am.-1	Gages, Pressure and Vacuum, Dial Indicating (for Air, Steam, Oil, Water, Ammonia, Chloro-fluoro Hydrocarbon Gases, and Compressed Gases)
WW-F-406D	Flanges, Cast Iron, (Classes 125 and 250) and Bronze (Classes 150 and 300)
WW-P-421D	Pipe, Cast Gray and Ductile Iron, Pressure (For Water and Other Liquids)

1.2 FEDERAL STANDARD.

No. 595a & Change Notices 1, 2, 3, 4, 5, & 6	Colors

1.3 HYDRAULIC INSTITUTE (HI) STANDARD.

Hydraulic Institute Standards for Centrifugal, Rotary & Reciprocating Pumps (14th Edition, 1983)

1.4 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) STANDARD.

MG 1-1978 Incl. Rev. 1 through 6	Motors and Generators

1.5 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) PUBLICATIONS.

A21.11-72	Rubber Gasket Joints for Gray Iron and Ductile Iron Pressure Pipe and Fittings
B16.1-75	Cast-Iron Pipe Flanges and Flanged Fittings
B16.5-77	Steel Pipe Flanges and Flanged Fittings
B31.1-80 & Am 80 & Am 81	Power Piping

1.6 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

A 53-80	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A 120-80	Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses

1.7 AMERICAN WATER WORKS ASSOCIATION (AWWA) PUBLICATIONS.

C111-80	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

1.8 MANUFACTURER'S STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS) PUBLICATIONS.

SP-58-75	Pipe Hangers and Supports - Materials, Design and Manufacture
SP-69-76	Pipe Hangers and Supports - Selection and Application

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ORIGINAL (Red)

2. GENERAL.

2.1 DESCRIPTION. The pumps shall be horizontal centrifugal of the types indicated and as described below. The driving units for the pumps shall be electric motors as described below.

2.2 SAFETY REQUIREMENTS. All gears, couplings, projecting setscrews, keys and other rotating parts so located that any person can come in close proximity thereto shall be fully enclosed or be properly guarded.

2.3 NAMEPLATES. Each major item of equipment shall have a standard nameplate securely affixed in a conspicuous place showing the serial number, model and the manufacturer's name and address. In addition, the nameplate for each pump shall show the capacity in gallons per minute at rated speed and head in feet; the nameplate for each motor shall show at least the minimum information required by NEMA MG 1-10.38. Such other information as the manufacturer may deem necessary to complete identification shall also be shown on the nameplate for each item requiring a nameplate.

2.4 WORK SPECIFIED ELSEWHERE. Concrete for foundations not specified below shall be as specified in section: "Concrete".

3. MATERIALS AND EQUIPMENT shall be as specified below and as shown, and shall be suitable for the service intended. Materials and equipment shall be new and except for tests, unused. Where two or more pieces of equipment performing the same function are required, they shall be duplicate products of the same manufacturer.

3.1 STANDARD PRODUCTS. Material and equipment shall be the standard products of a manufacturer of such products and shall essentially duplicate equipment that has been in satisfactory service in waterworks operations at least two years prior to bid opening. Items of equipment shall be supported by a service organization that is, in the opinion of the Contracting Officer, reasonably convenient to the site.

3.2 CAPACITIES AND EFFICIENCIES of all equipment and material shall be not less than those indicated.

3.3 CONFORMANCE WITH AGENCY REQUIREMENTS. Where materials or equipment are specified to be an approved type, the seal or label of approval from a nationally recognized testing agency adequately equipped and competent to perform such services shall

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be shown. A written certificate from the testing agency shall accompany the materials or equipment and shall state that the items have been tested and that they conform to the applicable requirements of the specifications and to the standards listed herein. In lieu of a certificate from a testing agency, published catalog specification data accompanied by the manufacturer's certified statement to the effect that the items are in accordance with the applicable requirements of the specifications and the referenced standards, will be considered by the Contracting Officer and may be acceptable as evidence that the items conform to agency requirements.

3.4 CONTRACT DRAWINGS for the pump and piping layout are general and may be modified as required for the installation of the equipment furnished. If any departures from the contract drawings are deemed necessary by the Contractor, details of such proposed departures and the reasons therefor shall be submitted in writing for approval as soon as practicable. Such departures shall be made only after written approval by the Contracting Officer, and at no additional cost to the Government.

4. SUBMITTALS. In accordance with section: "Special Provisions", the Contractor shall submit for approval items as specified herein on the following:

4.1 CATEGORY I.

Pumps
Motors
Controls, including schematic wiring diagram
Characteristic curves

4.2 CATEGORY II.

Written test report for each pump
Spare parts data
Operating and maintenance instructions

5. WORKMANSHIP. Materials and equipment shall be installed to conform with the contract documents, in accordance with the approved recommendations of the manufacturer and the applicable Standards of the Hydraulic Institute. The installation shall be accomplished by workers skilled in the type of work required under this section of the specifications.

6. CENTRIFUGAL WATER PUMPS.

6.1 GENERAL. The pumps shall be the horizontal, double suction, single stage centrifugal type.

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6.1.1 Pump Service. The pumps will be utilized for the following service:

	Pump No.
Line pressure booster pump for potable water service	1 & 2

6.1.2 Pump Drivers. The pumps shall have electric motor drive units and shall be directly connected to the driving units through solid shafts, flexible couplings, or free wheeling clutches.

6.1.3 Pump Construction. Except as specified below, centrifugal water pumps shall be constructed in accordance with the Standard of the Hydraulic Institute, Centrifugal Pump Section.

6.1.4 Pump Characteristics. The pumps shall be capable of delivering a design capacity of 350 gpm when operating against a Total Dynamic Head (TDH) of 315 feet, with a temperature of 68° F. and a specific gravity of 1.0. Pumps shall have a minimum guaranteed efficiency of 64 percent when operating at design capacity. Pumps must also be capable of delivering 400 gpm against a TDH of 305 feet, with a temperature of 68° F., a specific gravity of 1.0, and at this condition shall have a minimum efficiency of 65 percent. Minimum shutoff head available shall be 335 feet. Pumps shall operate at a maximum synchronous speed of 3,500 rpm. Pumps shall be standard right hand rotation, base mounted, horizontal size 2-1/2 x 3 x 10B, Series 410 as manufactured by Aurora Pump, Model 3095-7 as manufactured by PACO Pumps, or approved equal.

6.2 PUMP CASINGS shall be cast iron, designed to permit replacement of wearing parts. Horizontal split casings shall have the suction and discharge nozzles cast integrally with the lower half, so that the upper part of the casings may be removed for inspection of the rotating parts without disturbing pipe connections or pump alignment. Pump casings shall be of uniform quality and shall be free from blowholes, porosity, hard spots, shrinkage defects, cracks and other injurious defects. Defects in casings shall not be repaired except when such work is approved and is done by or under the supervision of the pump

manufacturer, and then only when the defects are small and do not adversely affect the strength or use of the casing.

6.3 IMPELLERS shall be of enclosed design and shall be constructed of bronze, carefully finished with smooth water passageways, and shall be statically and dynamically balanced. Impellers shall be securely keyed to the pump shaft.

6.4 WEARING RINGS shall be bronze and provided for all impellers. Wearing rings of a different composition or of a suitable ferrous material shall be provided for pump casings. Casing rings shall be securely fixed in position to prevent rotation. All rings shall be renewable and designed to ensure ease of maintenance.

6.5 SHAFTS shall be of high grade steel accurately machined and shall be of sufficient size and strength to perform the work required. Bronze removable shaft sleeves shall be provided for protection of the shaft in contact with water, and in the stuffing boxes. Shaft sleeves shall be keyed to the shaft.

6.6 STUFFING BOXES shall be water sealed with renewable bushings, and shall be designed to ensure a tight seal without excessive wear or friction on the shaft sleeve and to prevent air leakage into the pump under all conditions of operation. Seals shall be mechanical or conventional gland packed stuffing boxes. Glands shall be the split or solid type, with sufficient room to pack the box, and shall be held in place by swing bolts or other suitable devece.

6.7 COUPLINGS shall be heavy duty flexible type, keyed and locked to the shaft. The outside surface of the couplings shall be machined parallel to the axis of the shaft. The faces of the couplings shall be machined perpendicular to the axis of the shaft. Disconnecting the couplings shall be accomplished without removing the driver half or the pump half of the couplings from the shaft.

6.8 BALANCE. All rotating parts of the equipment shall operate throughout the required range without excessive end thrust, vibration or noise. Defects of this type that cannot be eliminated by installation adjustments will be sufficient cause for rejection of the equipment.

6.9 BEARINGS shall be ball or roller type, aand the main bearings shall take all radial and end thrust. Pumps that depend only on hydraulic balance to overcome end thrust will not be acceptable.

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6.10 LUBRICATION. Pumps with oil lubrication systems shall be designed so that all shaft bearings will be isolated from the pumped liquid. An automatic sight feed oiler shall be provided on a suitable mounting bracket with connection to the shaft tube. Grease type bearings shall be provided with fittings for a grease gun and, if the bearings are not easily accessible, with grease tubing extending to convenient locations. The grease fittings shall be of a type that prevents overlubrication and the buildup of pressure injurious to the bearings.

6.11 BASE PLATES. Pumps of each type shall be provided with a common base for mounting each pump and driving unit of each pump on the same base. Each base shall be constructed of cast iron with a raised lip tapped for drainage, or of welded steel shapes with suitable drainage pan.

6.12 COCKS, PLUGS AND ACCESSORIES. The pumps shall be equipped with air cocks, drain plugs, and single gages indicating discharge pressures for all pumps. Gages, equipped with a shutoff cock and snubber, shall conform to GG-G-76, Class 1, Style X, Type 1, minimum size 3-1/2 inches nominal diameter. Normal operating suction and discharge pressures of the pump shall be indicated on the midpoint range of the gages.

6.13 PIPING CONNECTIONS. The pump suction and discharge shall be provided with flanged fittings of suitable size and suitably arranged for piping shown. Pipe flanges shall conform to WW-P-406. All piping shall be installed so as to preclude the formation of air pockets.

6.14 FINISH. Pumps shall have painted or enamel finish as standard with the manufacturer, except that fire pumps shall be red, either No. 11105 or No. 11136 of Fed. Std. 595.

6A. ABOVEGROUND PIPING SYSTEM. Fittings shall be used for all changes in direction and for all connections. Changes in piping sizes shall be made using standard reducing pipe fittings. Short pipe nipples shall be extra-strong.

6A.1 PIPE AND FITTINGS.

6A.1.1 Size 3 Inches and Larger.

6A.1.1.1 Ductile Iron Pipe. Fed. Spec. WW-P-421, Grade C, thickness Class 52. Flanges and flanged fittings shall conform to ANSI B16.1, suitable for a working pressure of 200 psi. All pipe and fittings shall be cement lined.

6A.1.1.2 Steel Pipe. ASTM A 53 or A 120, Schedule 40, black steel with flanged fittings. Flanges for steel pipe shall conform to ANSI B16.5, Class 150, and shall be welded to the pipe. Welding shall be

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done by the metallic arc process in accordance with ANSI B31.1, including qualification of welders. Sections of pipe between flanged end connections shall be continuous; buttwelding of short sections of pipe to form a longer section of pipe will not be permitted. Fabrication of pipe fittings by welding will not be permitted, other than the welding of the flanges to the fitting.

6A.1.1.3 Pipe and Fittings. Provide AWWA C111 red rubber gaskets for flanges in water piping.

6A.2 VALVES. For vales see SECTION: WATER LINES, except gate valves installed inside pumphouse shall be supplied with wheel operators.

6A.3 PIPE SUPPORTS. MSS-SP-58 or SP-69, adjustable type. Finish supports shall be zinc plated. Provide pipe supports in accordance with MSS-SP-69 for maximum spacing.

7. ELECTRICAL WORK. Motors, manual and automatic motor control equipment and protective or signal devices required for the operation specified herein and any wiring required therefor but not shown on the electrical plans, shall be provided under this section in accordance with section: "Electrical Work".

8. CONCRETE FOUNDATIONS. Concrete for equipment foundations shall be as specified in section: "Concrete". Concrete foundations shall be integral with and of the same class as the building floor unless otherwise indicated. Class B concrete shall be used in foundations that are entirely separated from the surrounding floor. A premolded filler strip shall be installed between the foundation and the floor slab. Foundation bolts as required shall be furnished and positioned for proper location of the equipment during the placement of the concrete.

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9. OPERATING AND MAINTENANCE INSTRUCTIONS AND SPARE PARTS DATA.

9.1 BOUND INSTRUCTIONS AND SPARE PARTS DATA. Complete operating and maintenance instructions and spare parts for each item of equipment shall be furnished in accordance with section: "Special Provisions". The instructions shall include, but not be limited to, the following:

System layout showing piping, valves and controls
Approved wiring and control diagram
A control sequence describing startup, operation and shutdown
Lubrication instructions and trouble-shooting guide
Manufacturers' bulletins, cuts and descriptive data, parts list, and recommended stock spare parts

9.2 FRAMED INSTRUCTIONS. Approved wiring and control diagram showing the complete layout of the entire system, including equipment, piping, valves and control sequence, framed under glass or in approved laminated plastic, shall be posted where directed. In addition, condensed operating instructions explaining preventive maintenance procedures, methods of checking the system for normal safe operation, and procedures for safely starting and stopping the system shall be prepared in typed form, framed as specified above for the wiring and control diagrams, and posted beside the diagrams. Proposed diagrams, instructions and other sheets shall be submitted for approval prior to posting and shall be posted before acceptance of the system.

9.3 PERSONNEL INSTRUCTION. Upon completion of the work and at a time designated by the Contracting Officer, the services of one or more competent engineers shall be provided by the Contractor for a period of not less than one day to instruct a person (or persons) designated by the Contracting Officer in the operation and maintenance of equipment including all the items contained in the bound instructions.

10. TOOLS. Special tools necessary for the maintenance and repair of the pumps, and one pressure grease gun for each type of grease required for pumps, shall be furnished and mounted on a suitable rack where directed.

11. TESTS. Prior to the commencement of field tests, certified copies of manufacturers' factory test reports and factory pump test curves for each pump shall be submitted to the Contracting Officer. The field tests shall be performed in accordance with the applicable portions of the Standards of the Hydraulic Institute. All tests shall be conducted by an engineer representative of the pump manufacturer and witnessed by a representative of the Contracting Officer. In addition to the

tests, the Contractor shall operate the pumps, following installation, for a minimum of two hours at a head and capacity as directed by the Contracting Officer. Written reports shall follow the format recommended in the Standard of the Hydraulic Institute and shall be submitted to the Contracting Officer for each pump. Reports shall include characteristic curves showing capacities, heads, efficiencies, and horsepower throughout the entire range of the pump.

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ZERO ACCIDENTS

SECTION 15A
AIR HANDLING AND DISTRIBUTION EQUIPMENT

INDEX

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 AIR MOVEMENT AND CONTROL ASSOCIATION (AMCA) PUBLICATIONS.

99-72	Standard Handbook
210-74	Laboratory Method of Testing Fans for Rating
300-67	Test Code for Sound Rating Air Moving Devices

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

A 386-78	Specification for Zinc Coating (Hot-Dip) on Assembled Steel Products
B 117-73 (Rev 1979)	Salt Spray (Fog) Testing
D 1654-79A	Method of Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments

1.3 NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA) PUBLICATIONS.

ICS 2-78 Inc. Rev. 1 thru 4	Standards for Industrial Control Devices, Controllers and Assemblies
ICS 6-78 Inc. Rev. 1	Enclosure for Industrial Controls and Systems
MG 1-78 (Rev. 1-78, Rev. 2-79, Rev. 3-80, Rev. 4-80, & Rev. 5-80)	Motors and Generators

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1.4 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) PUBLICATION.

70-81 National Electrical Code

1.5 UNDERWRITERS' LABORATORIES, INC. (UL) PUBLICATION.

705-77 Power Roof Ventilators

2. GENERAL REQUIREMENTS. General requirements of Division 2 "Site Work" of this project apply to this project.

3. SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit data as specified herein on the following:

3.1 CATEGORY I. None

3.2 CATEGORY II.

3.2.1 Power Ventilators Sound Power Level Data

3.2.2 Roof Curbs

3.2.3 Certified Test Reports for Corrosion Protection

4. CORROSION PROTECTION. Special protection is not required for equipment that has a zinc coating conforming to ASTM A 386 or a duplex coating of zinc and paint. Where expressly stipulated in equipment requirements herein, the affected equipment items shall be protected by the manufacturer with a corrosion-inhibiting coating or paint system that has proved capable of satisfactorily withstanding corrosion in accordance with ASTM B 117. Test period shall be 125 hours for equipment intended for installation indoors and 500 hours for equipment installed outdoors or otherwise subjected to a marine atmosphere. Each specimen shall have a standard scratch as defined in ASTM D 1654.

4.1 CORROSION CRITERIA. Upon completion of exposure, coating or paint shall show no indication of deterioration or loss of adhesion, nor shall there be indication of rust or corrosion extending further than 1/8 inch on either side of original scratch.

4.2 THICKNESS OF COATING. Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, conditions of application, and dry film thickness.

PART 2 - PRODUCTS

5. FANS. AMCA 99, statically and dynamically balanced, with air capacities, brake horsepowers, and fan types. Fans shall be sound-rated in accordance with AMCA 300. Fan bearing life shall be minimum 200,000 hours at operating conditions. Provide guard bird screens for outdoor inlets and outlets. Equip with automatic (backdraft) dampers. Have thermal overload protection in the operating disconnect switches within the building. Housings and fan wheels shall be aluminum.

5.1 POWER ROOF VENTILATORS. UL 705 and AMCA 210, (centrifugal) fans in housings of corrosion-resistant metal. Ventilators shall be UL classified and shall carry the AMCA seal. Equip motors with unfused safety disconnect switches mounted under fan housings. Provide factory-fabricated roof curbs.

5.2 MOTORS AND MOTOR STARTERS. NEMA MG-1, NEMA ICS 2, and NEMA ICS 6, respectively, with electrical characteristics as indicated. Motors shall be dripproof. Motor starters shall be magnetic-across-the-line type with water-resistant enclosure.

5.3 ROOF CURBS. Factory-fabricated sheet-steel structural members as indicated. The curbs shall have high load-bearing capacities attained by a system of internal bulkheads, welded into position at logical intervals along the length of rails. Provide minimum 4-inch cants, 2 by 6 factory-installed wood nailers, and fully mitered and sections. Use welded 18-gage galvanized steel shell, base plate, and counterflashing. Conform with other requirements indicated.

PART 3 - EXECUTION

6. INSTALLATION. Install air distribution equipment as indicated and in accordance with the manufacturers' instructions. Provide clearance for inspection, repair, replacement, and service. Electrical work shall conform with NFPA 70 and Division 16, "electrical." Provide conduits for wirings. Equip motors

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with unfused safety disconnect switches mounted. Provide overload protection in the operating disconnect switches and magneti starters.

7. FIELD INSPECTION AND TESTS. Schedule and administer the specified tests. Provide personnel, instruments, and equipment for such tests. Correct defects and repeat the respective inspection and tests. Give the Contracting Officer ample notice of the dates and times scheduled for tests and trial operations. Conduct inspection and testing in the presence of the Contracting Officer. Submit test data certified by the equipment manufacturer's representative.

7.1 FIELD INSPECTION. Prior to initial operation, inspect equipment installation for conformance with drawings and specifications.

7.2 FIELD TESTS.

7.2.1 PRELIMINARY TESTS. For air handling equipment and its components, perform an operational test for a minimum period of 2 hours.

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SECTION 15B
SPACE TEMPERATURE CONTROL SYSTEMS

INDEX

PART 1 - GENERAL

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) PUBLICATIONS.

70-84	National Electrical Code
90A-81	Installation of Ventilating Systems

2. GENERAL REQUIREMENTS. General requirements apply to this section with the additions and modifications specified herein.

2.1 DESCRIPTION OF WORK. The work includes providing new automatic space temperature control (ATC) system including associated equipment and appurtenances. Provide each system complete and ready for operation. Equipment, materials, installation, and workmanship shall be in accordance with NFPA 70 and NFPA 90A. Provide control systems to maintain the conditions indicated, to perform the functions indicated, and to operate in the sequence specified. Provide control systems of the electric type. Installation shall be made by or under the direct supervision of competent technicians regularly employed in the installation and calibration of automatic temperature controls (ATC). Control equipment, valves, panels, and dampers shall bear the manufacturer's name plate.

2.2 SUBMITTALS REQUIRED.

2.2.1 Manufacturer's Data.

a. Dampers, and operators
b. Controllers, including complete wiring and connection diagrams
c. Temperature sensors, including complete wiring and connection diagrams
d. Switches, relays, transducers, including complete wiring and connection diagrams

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2.2.2 Shop Drawings.

a. Temperature control schematic and wiring diagram
b. Sequence of operation for each system and function
c. Equipment interlocks as specified under "Sequence of Operations"
d. Switches, relays, transducers, including complete wiring and connection diagrams

2.2.3 Certificate of Compliance.

a. Pipe and fittings

2.2.4 Certified Data.

a. Damper leakage rates
b. Operator power characteristics
c. Inherent flow characteristics of each damper

PART 2 - PRODUCTS

3. SYSTEM COMPONENTS. Sensors, industrial or commercial grade, shall be complete with the automatic temperature control (ATC) equipment provided and shall have accuracies as stated herein. Instrument characteristics such as hysteresis, relaxation time, span, including maximum and minimum limits shall be coordinated for all applications of sensors and controls, so that the control system shall operate smoothly and accurately throughout the design.

3.1 AUTOMATIC TEMPERATURE CONTROL DAMPERS. Provide opposed blade balanced dampers, factory fabricated of extruded aluminum with antifriction pivot bearings, in accordance with SMACNA duct construction standards. Provide neoprene or felt seals along the damper blade edges and ends to maintain tight closure in closed position. Maximum air leakage rate for outside air intake dampers and exhaust air dampers shall not exceed 0.5 percent when closed against a 4-inch water gage static pressure. Damper operators shall have sufficient power to limit air leakage to the specified rate. Select dampers to provide correct flow characteristics as required by each application.

3.2 DAMPER OPERATORS. Provide electric motor type with spring return so that, in the event of power failure, they will FAIL SAFE in the normally closed position.

3.3 CONTROLLERS. Provide electric, type controllers and match to the devices being controlled. Controllers shall have field selectable adjustable setpoint, and adjustable proportional band for analog control or adjustable differential for binary two-position control.

3.4 SPACE THERMOSTATS. Thermostats shall be lock shield type and shall have a 2 degrees F. differential and a setpoint range of 40 to 75 degrees F. Thermostats shall be two-position type.

4. ELECTRICAL AND ELECTRONIC POWER SUPPLY AND WIRING. 120 volts or less, 60 Hertz, 2 pole, 3 wire with ground. The devices shall be UL listed or FM approved.

4.1 TRANSFORMERS. Provide step-down transformers where control equipment operates at lower than the line circuit voltage. Transformers serving individual ventilating units shall be fed from the fan motor leads, or fed from the nearest distribution panelboard or motor control center, utilizing circuits provided for the purpose. Transformers, other than transformers in bridge circuits, shall have primaries wound for the voltage available and secondaries wound for the correct control circuit voltage. Transformer shall have capacity to operate simultaneously all apparatus connected to it and shall be capable of carrying 125 percent of the load for one hour in an ambient air temperature of 110 degrees F. Transformers shall be enclosed in a steel cabinet with conduit connections and shall have a disconnect switch on the primary side, and a fuse cut-out on the secondary side.

PART 3 - EXECUTION

5. INSTALLATION. Provide all necessary wiring and conduit to connect the ATC components to secure an operational ATC system.

5.1 WORKMANSHIP. Wiring and the installation thereof shall conform to NFPA 70.

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6. SEQUENCE OF OPERATION.

6.1 ROOF VENTILATOR. A thermostat on the wall shall energize the exhaust fan when the room temperature is 95° F. or above. The exhaust fan and motorized fresh air intake dampers are interlocked. The dampers shall open as soon as the exhaust fan is energized. The dampers shall close when the exhaust fan is deenergized manually or thermostatically.

6.2 ELECTRIC BASEBOARD HEATER. A thermostat on the wall shall energize the heater when below specified temperature and shall turn off the heater when satisfied.

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ZERO ACCIDENTS

SECTION 16A
ELECTRICAL WORK

INDEX

Attachment: Standard Drawing 40-06-04, Sheet 26
40-15-01, Sheet 2

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 FEDERAL SPECIFICATIONS.

J-C-30A	Cable and Wire, Electrical (Power, Fixed Installation)
L-P-387A	Plastic Sheet, Laminated, Thermosetting (For Designation Plates)
W-B-30A	Ballast, Fluorescent Lamp
W-C-375B/GEN	Circuit Breakers, Molded Case; Branch Circuit and Service (General Spec.)
W-C-586C	Conduit Outlet Boxes, Bodies, and Entrance Caps, Electrical: Cast Metal
W-C-596E/GEN	Connector, Electrical, Power, General Specifications for

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W-F-408C & Am.-1	Fittings for Conduit, Metal, Rigid, Thick-Wall and Thin-Wall (EMT) Type) Fixture
W-F-414E	Lighting (Fluorescent, Alternating-Current, Pendant Mounting)
W-J-800D	Junction Box; Extension, Junction Box; Cover, Junction Box (Steel, Cadmium, or Zinc-Coated)
W-L-00116D	Lamps, Fluorescent (General Specification)
W-P-455a & Am-6	Plate, Wall Electrical
W-S-610C	Splice Conductor
W-S-865c & Int Am-2	Switch, Box, (Enclosed), Surface-Mounted
HH-I-553C & Am-1	Insulation Tape, Electrical, (Rubber, Natural and Synthetic)
HH-I-595C	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

1.2 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARDS.

C97.1-1972	Low-Voltage Cartridge Fuses 600 Volts or Less

1.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARD.

D 69-78	Friction Tape for General Use for Electrical Purposes

1.4 INSTITUTE OF ELECTRICAL AND ELECTRONIC ENGINEERS (IEEE) STANDARD.

No. 142-1982	Recommended Practice for Grounding of Industrial and Commercial Power Systems

1.5 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) STANDARDS.

ICS 1-1978 Incl Revs. 1 thru 4	General Standards for Industrial Control and Systems
ICS 2-1978 Incl Revs. 1 thru 4	Industrial Control Devices, Controllers and Assemblies
ICS 3-1978 Incl Rev. 1 & 2	Industrial Systems
ICS 4-1977 Rev Sep 1978	Terminal Blocks for Industrial Control Equipment and Systems
ICS 6-1978 Incl Rev. 1	Enclosures for Industrial Controls and Systems
SG 3-1983	Low-Voltage Power Circuit Breakers

1.7 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) PUBLICATION.

No. 70-1984 National Electrical Code

1.8 UNDERWRITERS LABORATORIES, INC. (UL) STANDARDS.

Building Materials Directory

Electrical Construction Materials Directory

UL 6	Rigid Metal Conduit (Oct 23, 1981; 9th Ed.)
UL 20	General-Use Snap Switches (Dec 28, 1978, Rev. Feb 26, 1982)
UL 467	Grounding and Bonding Equipment (November 7, 1972,5th Ed.; Rev thru March 26,1982)

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UL 508	Industrial Control Equipment (May 9,1977 12th Ed.; Rev thru March 18, 1982)
UL 797	Electrical Metallic Tubing (Aug 19, 1977; 4th Ed.)

2. GENERAL.

2.1 RULES. The installation shall conform to the requirements of the National Electric Code and requirements herein. In case of any differences or discrepancies between the specifications and the National Electric Code, the specifications shall govern.

2.2 COORDINATION. The contract drawings indicate the extent and the general location and arrangement of equipment, conduit and wiring. The Contractor shall study building plans and details so that the outlets and equipment will be properly located and readily accessible. Lighting fixtures, equipment, and outlets shall be located to avoid interference with mechanical or structural features; otherwise, lighting fixtures shall be symetrically located according to the room arrangement. If any conflicts occur necessitating departures from the contract drawings, details of departures and reasons therefor shall be submitted as soon as practicable for written approval of the Contracting Officer.

2.3 CAPACITIES of equipment and material shall be not less than those indicated.

2.4 WORKMANSHIP. All materials and equipment shall be installed in accordance with recommendations of the manufacturer, as approved by the Contracting Officer, to conform with the contract documents. The installation shall be accomplished by workers skilled in the applicable type of work.

2.5 OPERATING MANUAL AND PARTS LIST. In accordance with section: "Special Provisions", operating manuals and parts lists shall be supplied for the pump controller.

3. MATERIALS AND EQUIPMENT shall conform to the respective publications and other requirements specified below. Other materials and equipment shall be as specified herein and as shown on the drawings and shall be the products of manufacturers regularly engaged in the manufacture of such products.

3.1 BALLAST, FLUORESCENT LAMP. High-power-factor type conforming to W-B-30. In addition, ballasts for 34 watt and larger shall be class P and shall be automatic resetting type.

3.2 CABLE, FLEXIBLE, CONDUCTORS shall conform to J-C-30, Type ACHH or ACT; Type NM or NMC; Type SE; or Type UF or USE, as appropriate for the intended use.

ORIGINAL (Red)

3.3 CIRCUIT BREAKERS shall conform to NEMA SG 3 or W-C-375, as appropriate for the use intended.

3.4 CONDUCTORS, INSULATED shall conform to J-C-30, types as specified.

3.5 CONDUIT shall conform to UL 6.

3.5A CONDUIT COATINGS.

3.5A.1 Plastic. Fed. Spec. LC-530, type I or L-P-1035; composition, type, class and grade suitable for the purpose, thickness as required for the type I system of Fed. Spec. L-C-530 or NEMA Standard RN1, type 40.

3.5A.2 Epoxy System. Fed. Spec. L-C-530, type II.

3.5A.3 Coal-Tar System. Primer and enamel conforming to AWWA C203. The thickness of the dry coating system shall not be less than 1/6-inch at any point.

3.6 CONNECTORS, WIRE PRESSURE shall conform to W-S-610.

3.7 DEVICE PLATES shall conform to W-P-455.

3.8 FITTINGS, CABLE AND CONDUIT shall conform to W-F-406 and W-F-407.

3.9 FIXTURES, FLUORESCENT shall be general purpose, conforming to W-F-414, type II, style as approved by the Contracting Officer, and to W-F-1662.

3.10 LAMPS, FLUORESCENT shall conform to W-L-116.

3.11 MOTOR CONTROLS shall conform to NEMA ICS 1, ICS 2, ICS 3, ICS 4 and ICS 6, and to UL 508 and UL 845.

3.12 OUTLETS shall conform to W-C-586.

3.13 OUTLET BOXES shall conform to W-J-800.

3.14 PANELBOARDS shall conform to W-J-800, class 1, and type I, class 2.

3.15 SERVICE EQUIPMENT shall conform to W-C-375 and UL 869, general purpose enclosure.

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3.16 SPLICE, CONDUCTOR shall conform to W-S-610.

3.17 SWITCHES shall conform to the following:

3.17.1 Enclosed Safety Switches: W-S-865, type HD, class and design as approved.

3.17.2 Snap Switches: UL 20.

3.18 TAPE shall conform to ASTM D 69, HH-I-595, or 3, as appropriate.

3.19 TUBING, ELECTRICAL, ZINC COATED METALLIC STEEL shall conform to UL 797.

3.20 WIREWAYS shall conform to UL 870.

3.21 GROUNDING AND BONDING shall comply with UL 467 and IEEE 142.

4. APPROVAL OF MATERIALS AND EQUIPMENT will be based on manufacturers' published data.

4.1 THE LABEL OR LISTING of the Underwriters Laboratories, Inc., will be accepted as evidence that the materials or equipment conform to the applicable standards of that agency. In lieu of this label or listing the Contractor shall submit a statement from a nationally recognized and adequately equipped testing laboratory indicating that the items have been tested in accordance with the required procedures and that the materials and equipment comply with all contract requirements. Materials and equipment installed in hazardous locations must bear the UL label unless the data submitted from other testing agency is specifically approved in writing by the Contracting Officer.

4.2 FOR OTHER THAN EQUIPMENT AND MATERIALS SPECIFIED TO CONFORM TO UL STANDARDS, a manufacturer's statement signed by a company official indicating complete compliance with the applicable Federal Specification, Military Specification, or NEMA, ASTM or other commercial standard, will be acceptable.

5. SUBMITTALS. In accordance with section: "Special Provisions", the Contractor shall submit for approval, data as specified herein on the following:

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5.1 CATEGORY I.

Service Equipment
Motor Control
Equipment and Devices for Use in Other Than General Purpose Areas
Panelboards

5.2 CATEGORY II. (For information only)

Standard Lighting Fixtures Listed in Series 40-06-04
Disconnect Switches
Conductors
Cable
Steel Conduit Coating Methods
Wiring Devices

6. GROUNDING. Except where specifically indicated otherwise, all exposed noncurrent-carrying metallic parts of electrical equipment and devices and neutral conductor of the wiring system shall be grounded.

7. WIRING METHODS.

7.1 GENERAL. Unless otherwise indicated, wiring shall consist of insulated conductors installed in rigid zinc-coated steel conduit, electrical metallic tubing or intermediate metal wiring, Type I. Wiring sizes shall be as shown on the drawing and shall be in accordance with National Electrical Code

7.2 CONDUIT AND TUBING SYSTEMS shall be installed as indicated. Conduit sizes shall be as required to accommodate the conductors to be installed. Electrical metallic tubing may be installed in concrete and grout, in dry locations. EMT shall not be installed in or below slab on grade or in other damp or wet locations. IMC type I may be used as an option for rigid steel conduit in areas as permitted by the National Electrical Code, except that IMC shall not be used within slab on grade. IMC installed below slab on grade shall be corrosion protected as required for rigid steel conduit by this specification.

7.2.1 Installing Conductors and Conduit Below Slab on Grade or in the Ground. All electrical wiring below slab on grade shall be protected by a conduit system. No conduit system shall be installed horizontally within concrete slab on grade. For slab on grade construction, horizontal runs of coated rigid

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steel or coated intermediate metal conduit (IMC) shall be installed below the floor slab. Conduit passing vertically through the slab shall be rigid steel or IMC. Rigid steel or IMC installed below slab on grade or in the earth shall be field wrapped with 0.10 inch thick pipe-wrapping plastic tape applied with a 50 per cent overlap, or shall have a factory-applied plastic resin, epoxy or coal tar coating system. Zinc coating may be omitted from metallic conduit which has a factory-applied system.

7.2.1.1 Field Made Joints, Fittings, Abrasions and Coating Holidays shall be coated with material equivalent to the above.

7.2.2 Changes in Direction of runs shall be made with symmetrical bends or cast metal fittings. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Care shall be taken to avoid introduction of trash, dirt, debris or other objectionable matter into the conduit during construction, and any such materials shall be removed from the conduit.

8. BOXES AND SUPPORTS shall be installed as required by the National Electrical Code and as recommended by the conduit manufacturer.

9. DEVICE PLATES shall be installed on all outlets and fittings as required to suit the devices installed. Plates shall be zinc coated steel or cast ferromagnetic metal.

10. RECEPTACLES shall be rated 20 amperes, 125 volts, two pole three wire grounded type with polarized parallel slots, in accordance with W-C-596, and shall be grounded by connection to the mounting yoke. Special-purpose or heavy duty receptacles shall be as required for the equipment to be installed, as approved by the Contracting Officer.

11. WALL SWITCHES shall be totally-enclosed toggle (tumbler) type as approved by the Contracting Officer. Switches shall be rated 20 ampere, 120 volts or 277 volts for use on AC only.

12. SERVICE EQUIPMENT AND DISCONNECT SWITCHES. Service-disconnecting means shall be enclosed circuit breaker with external handle for manual operation, suitable for the equipment to be installed and as approved by the Contracting Officer.

13. PANELBOARDS. Power, lighting and appliance branch circuit panelboards shall be circuit-breaker equipped, type I, as approved by the Contracting Officer. Circuit breakers shall be suitable for the use intended.

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14. MOTORS furnished under this and other sections of these specifications shall be of sufficient size for the duty to be performed and shall not exceed the full load rating when the driven equipment is operated at specified capacity under the most severe conditions likely to be encountered. Integrally mounted motors are those in equipment where the motor housing and driven equipment housing are integral and on the same common shaft. Pump motors shall have the following horsepower ratings:

Pumps Nos. 1 and 2: 50 horsepower

Unless otherwise specified, all motors shall have open frames and continuous-duty classification based on a 40 degree C ambient reference temperature. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics unless other characteristics are specified elsewhere. When electrically driven equipment furnished under other sections of these specifications differs in size or rating from the indicated design, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, starters, controls, and branch circuit protection to accommodate the equipment actually installed. Each motor controller and/or disconnect switch hereinafter specified shall be clearly labeled on the cover to indicate the equipment controlled. The labeling shall be done with a light-colored paint and letters not less than 5/8 inch high.

15. MOTOR CONTROL. Each motor or group of motors requiring a single control shall be provided under other sections of these specifications with a suitable controller and devices that will perform the functions as specified for the respective motors. The motor controller shown on the drawings is for reference only. It shall be mounted on a wall, at an easily accessible location not more than six feet above floor level. The control voltage of magnetic starters shall not exceed 300 volts. Each motor of 1/8 horsepower or larger shall be provided with thermal overload protection either integral with the controller or mounted in a separate enclosure. All overload devices shall be located and be accessible as specified above for controllers.Protective devices shall be automatic-reset type. The pump motor controller shall be so designed that Pumps Nos. 1 and 2 operate alternately under normal operating conditions. The pump controller shall provide automatic on-off switching with manual override, and be as approved by the Contracting Officer.

15A. TELEMETRY CONTROL shall be furnished and installed for level control of the water storage tank. The Water Level Control System will include sensing the water level in the tank, and through a communication link, control the operation of the booster pumps located about 1-1/2 miles from the tank. Since the usage rate will vary from day to day, pump operation must be controlled from the tank water level and cannot be programmed on a time or average usage basis. An ancillary function of the system is to display a warning signal at the booster station if the water level in the tank is not maintained within the specified range. The functions to be performed are as follows:

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Level 1589.5 of water tank - High Water Alarm
Level 1588.5 of water tank - #1 pump OFF
Level 1587.5 of water tank - #2 pump OFF
Level 1585.0 of water tank - #1 pump ON
Level 1582.0 of water tank - #2 pump ON
Level 1578.0 of water tank - Low Water Alarm

The telemetry control system shall be fully complete and operational and include the following major components:

15A.1 PRESSURE TAP located in the valve vault at the water storage tank.

15A.2 OIL/WATER INTERFACE with an oil seal will be located in the valve vault. Use mineral oil for pressuring sensing from the vault to the transmitter. Mineral oil shall be nontoxic and suitable for a potable water system.

15A.3 TELEMETRY TRANSMITTER consisting of a pressure transducer and signal generator in a NEMA 3R enclosure. Mount the transmitter on the side of the water storage tank. Insulate and include a thermostatically controlled heater for the transmitter enclosure.

15A.4 CONTROL WIRE shall be a minimum of Number 22 six-pair direct burial cable. Control wire shall be twisted full metallic, voice grade, capable, copper shielded, moisture proof, and rodent proof. Install control wire at a minimum of 2 feet below grade, in the same trench as the water main, provided it is located on a shelf to one side and rests on undisturbed earth. Bury underground tape warning system 1 foot below the finished ground surface before final backfilling of trenches.

15A.5 CONTROL PANEL shall include a signal receiver, converter, and controller. All equipment shall be solid state design with modularized plug-in design permitting simple field replacement of printed circuit cards. Booster pump controls shall be housed in a NEMA 4 enclosure. The control circuits on the magnetic starters for the pumps are to be directly connected to the level controller.

15A.6 ELAPSE TIME METERS shall be included for each of the two new booster pumps with space for a future pump. Elapsed time meters shall be nonreset type graduated in hours and tenths.

15A.7 LIGHTNING ARRESTERS shall be provided at all line terminations.

15A.8 ACCESSORIES necessary for the operation of the control system shall be included.

The alarm condition shall activate a light mounted in such a manner to be easily visible from the highway passing the pumping station. The light shall be of the revolving, high intensity type, red color.

Power requirements for the transceiver are 110/1/60 and are to be fed by a 15A breaker on a separate dedicated circuit.

The switching current capacity of the transceiver/decoder shall be sufficient to handle the load generated by the booster pump panel control circuits, and the alarm light circuits. If not, auxiliary relays shall be provided for that purpose. Preference will be given to solid state switching and relay devices.

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The panel shall be of NEMA 4 construction and shall be furnished with the following features:

a. Through the door disconnect switches for 460/3/60 power to pump motors.

b. Separate circuit breaker for each pump motor.

c. Separate fused control circuit transformer and control power circuit breaker.

d. Electronic alternator to provide booster pump alternation at the end of each pump run cycle.

e. Pump running lights on the panel door.

f. ON-OFF-Automatic door mounted switch, such that in an emergency, e.g., communication failure, the pumps can be operated with manual control.

g. Terminal board for connections to transceiver.

h. HWA and LWA door mounted lights.

The equipment specified in this section shall be submitted for approval. Where several items are shown on the same data page, the submitted item shall be identified. Failure to supply adequate or clear data shall be cause for disapproval.

All components must function in a manner to produce the desired control. To insure this compatibility, all system components will be furnished by a single supplier who must guarantee that the entire Water Level Control System will operate satisfactorily and in accordance with these specifications for a period of 1 year after startup.

At his option, the supplier may procure components from other sources, but all items so obtained must be covered under the principal supplier's guarantee.

16. MOTOR DISCONNECTS shall be provided for each motor. Each disconnect shall be enclosed, horsepower rated in accordance with W-S-865, table III, and be located so that the motor controller is easily visible from the disconnect.

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17. TRANSFORMERS shall be general-purpose dry-type in a weatherproof enclosure, in conformance with Appalachian Power Company requirements, as approved by the Contracting Officer.

18. LAMPS AND LIGHTING FIXTURES shall be fluorescent, 120 volt operation, as approved by the Contracting Officer. Lamps shall be 40 watt rating, cool-white color characteristics, of a type that does not require starter switches. Ballasts shall consume not more than 86 watts when operating two F40T12 rapid start fluorescent tubes with full light output, shall be UL listed and of a type that can be used with both 34/35 watt lamps without loss of life or performance of the lamps or ballasts. The Contractor shall furnish and install all accessory devices and materials required for proper operation.

19. IDENTIFICATION NAMEPLATES shall be provided and installed on all major items of equipment, and on such other items as may be provided by the manufacturers of the items as standard. All required nameplates shall be made of laminated plastic in accordance with L-P-387, with black outer layers and white core, chamfered edges. Plates shall be fastened to equipment with black-finished round head screws or approved nonadhesive metal fasteners. At the option of the Contractor, the equipment manufacturer's standard embossed nameplate material with black paint-filled letters may be furnished in lieu of laminated plastic.

20. EQUIPMENT CONNECTIONS. All wiring not furnished or installed under other sections of the specifications for the connection of electrical equipment as indicated on the drawings shall be furnished and installed under this section of the specifications. Connections shall comply with the applicable requirements of paragraph: "Wiring Methods".

21. PAINTING OR FINISHING. Field-applied paint on exposed surfaces shall be provided under section: "Painting".

22. TESTS. After the installation is completed , and at such time as the Contracting Officer may direct, the Contractor shall conduct operationg tests prior to approval of the completed work. All equipment shall be demonstrated to operate in accordance with the requirements of these specifications. The test or tests shall be conducted in the presence of the Contracting Officer or his authorized representative. The contractor shall furnish all instruments, personnel and other equipment or materials required to perform the tests, and shall submit to the Contracting Officer, in writing, the results of the tests.

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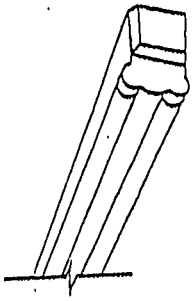
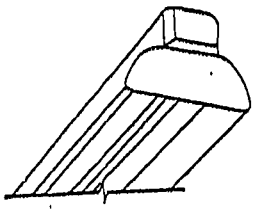
CORPS OF ENGINEERS

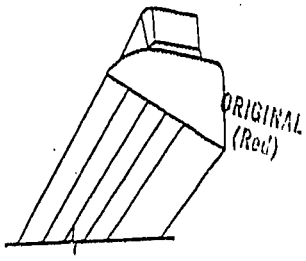
DEPARTMENT OF THE ARMY



TYPE 220
Without
Reflector



TYPE 221
With Symmetric
Reflector



TYPE 222
With Asymmetric
Reflector

Single and Double Lamp Fluorescent Strip Fixture

Suffix	Description
A	One 40 watt lamp
B	Two 40 watt lamps

Fixture shall conform to UL 57 and shall have a die-formed steel channel with a minimum nominal thickness of 0.030 inch, suitable mounting holes and 1/2-inch knockouts in back. Channel and end fittings shall have a baked white enamel finish. Channel covers shall have threaded fittings for reflector mounting, shall be constructed of die-rolled steel, and shall be finished with baked white enamel. All ferrous metal parts shall receive a rust inhibitive coating before application of finish coat. Reflectors shall be designed for direct attachment to the channel cover with suitable threaded fittings. End caps shall be provided at the ends of each row of fixtures and at each end of single fixtures. Reflectors shall be manufacturer's standard commercial product and shall be constructed of die-formed aluminum with highly polished finish, or steel with white porcelain enamel finish, or steel with baked white enamel finish. Fixture shall be suitable for surface mounting or pendant mounting. Fixture shall be prewired.

Fixture types indicated on this sheet shall also conform to requirements specified and indicated in the contract documents.

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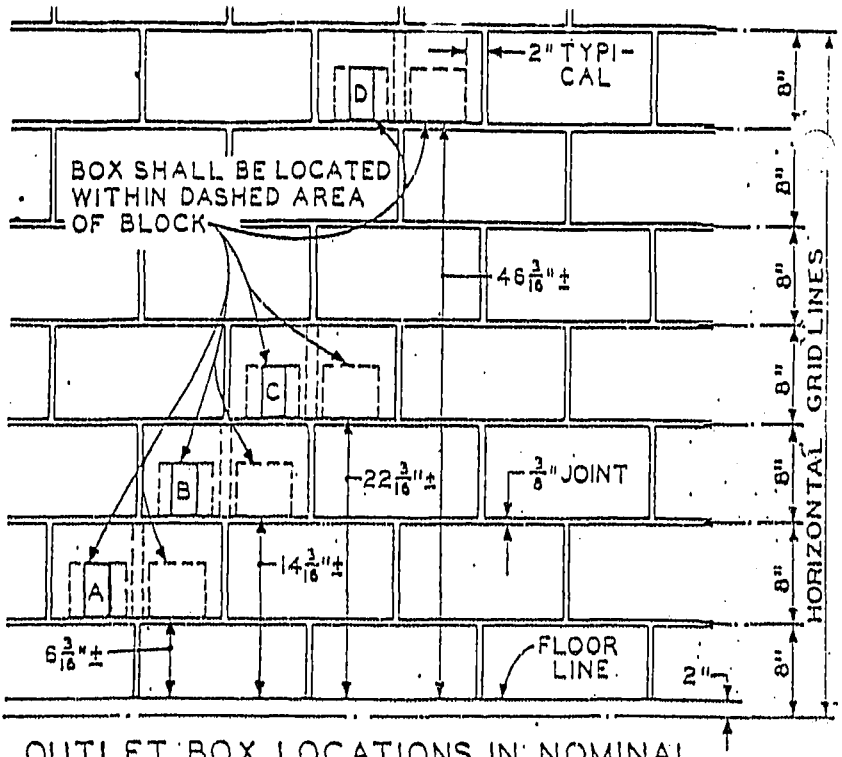

OUTLET BOX LOCATIONS IN NOMINAL 8"X16" GLAZED TILE OR CONCRETE BLOCK

LEGEND:

A. OUTLET BOX LOCATION WHERE FIN TUBE RADIATORS ARE INSTALLED. IF SPACE DOES NOT PERMIT MOUNTING BELOW RADIATOR, MOUNT OUTLET BOX IN SAME RELATIVE POSITION IN BLOCK ABOVE RADIATOR.

B. STANDARD LOCATION FOR OUTLET BOX WHEN INDICATED AS 1'-0" ABOVE FLOOR.

C. OUTLET BOX LOCATION TO BE USED IN GARAGES OR AREAS REQUIRING OUTLET BOX TO BE AT LEAST 18" UP FROM FLOOR.

D. TYPICAL OUTLET BOX LOCATION FOR SWITCH.

NOTE:

1. DIMENSIONS SHOWN FROM FLOOR ARE APPROXIMATE AND MAY VARY ACCORDING TO BLOCK SIZE AND SPECIAL CONSTRUCTION REQUIREMENTS.

CAST BOXES

NOTES:

1. MOUNTING HEIGHT OF CAST BOXES SHALL BE AS SPECIFIED IN LEGEND.
2. WHERE CAST BOXES ARE REQUIRED BY THE SPECIFICATIONS THEY SHALL BE FURNISHED WITH EXTERIOR MOUNTING LUGS AND FACTORY THREADED HUBS. EACH HUB SHALL BE FORMED WITH AN INTEGRAL BUSHING, SO SHAPED TO PRESENT A SMOOTH SURFACE FOR THE INSULATED CONDUCTORS. BOXES FOR FLUSH MOUNTING NEED NOT HAVE EXTERIOR MOUNTING LUGS, HOWEVER, DRILLED MOUNTING HOLES IN BOXES WILL NOT BE PERMITTED.

REVISED SEP. 1969

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DWG. NO. 40-15-01

SHEET 2

DISK N (bjk)
PROJECT C10526
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ZERO ACCIDENTS

SECTION 16B
ELECTRIC SPACE HEATING EQUIPMENT

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS (ASHRAE) PUBLICATION.

Handbook & Product Directory, Equipment (1983)

1.2 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) PUBLICATION.

No. ICS 6-1978 Enclosures for Industrial Controls and Systems Incl Rev 1

1.3 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) PUBLICATION.

No. 70-1984 National Electrical Code

1.4 UNDERWRITERS' LABORATORIES, INC. (UL) STANDARDS.

No. 1025 Electric Air Heaters (November 10, 1980, 2nd Ed; Rev thru January 8, 1982)

No. 1042 Electric Baseboard Heating Equipment (March 2, 1979, 2nd Edition; Errata June 8, 1979; Rev thru May 23, 1980)

2. SUBMITTALS. Sufficient information shall be included to determine compliance with the drawings and specifications. Power and control wiring, safety devices and color of finish shall also be indicated. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit for approval, data as specified herein on the following:

2.1 CATEGORY I. None

2.2 CATEGORY II.

Electrical heating devices
Electrical heating controls

3. GENERAL.

3.1 SAFETY. The Contractor shall submit proof, if requested by the Contracting Officer, that the materials, appliances, equipment or devices that he furnishes and installs under this contract, meet the Underwriters' Laboratories, Inc., requirements regarding fire and casualty hazards. The label of, or listing by, the Underwriters' Laboratories, Inc., will be accepted as conforming with this requirement. In lieu of the label of listing, the Contractor may submit independent proof, satisfactory to the Contracting Officer, that the materials, appliances or devices conform to the published standards, including methods of test, of the Underwriters' Laboratories, Inc.

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3.2 CODES. Unless otherwise specified, all work shall be in accordance with the NEC.

4. ELECTRIC BASEBOARD RADIATION.

4.1 GENERAL. Electric baseboard heaters shall have wattage, voltage, phase, and Btu/hr output as shown on the drawings or as specified. Complete baseboard assembly shall comply with the requirements of the UL 1025 and the requirements specified. Units shall be furnished and installed complete with heating elements, brackets, end closures, splice plates, interior and exterior corners, and accessible wiring compartment. Maximum outlet air temperature and enclosure surface temperature, under continuous operation, shall not exceed 200 degrees F.

4.2 HEATING ELEMENTS. Heating elements shall consist of nickel chromium heating wire embedded in magnesium oxide insulating refractory and sealed in corrosion-resisting sheath. The ends of elements shall be sealed and enclosed in a terminal box and element sheath shall be mechanically pressed after filling to insure maximum magnesium oxide compaction. Sheath shall be finned aluminum casting, steel with fins brazed to sheath. Steel sheath and fins shall be corrosion protected by high-temperature aluminized finish. Fins shall be spaced a maximum of six per inch, where used. Heat transfer between sheath and fins shall be uniform. Maximum sheath surface temperature shall not exceed 750 degrees F. Maximum watt density per linear foot of element shall not exceed 200 watts. Elements shall be free from expansion noise and 60-cycle hum.

4.3 ENCLOSURE. Enclosure shall be steel with panel thicknesses not less than 18 US gage front and 20 US gage back and shall be rigidly reinforced and supported for resistance to damage from floor maintenance equipment. Enclosure shall have no sharp or rough edges and shall form a strong rigid cover. Heavy-gage gusset plates for stiffening the enclosure, if required to maintain uniform shape, shall be provided. Front shall be removable. Enclosures shall be wall hung with bottom not less than 6 inches above the finished floor and shall be suitable for the space available. End plates and corner pieces shall be die formed with round edges, fit flush with enclosure surface, and shall be neat in appearance. No direct contact between enclosure and heating element will be permitted. Enclosure shall have the manufacturer's standard factory baked enamel finish. Connection box shall be designed to permit power supply and control wiring from bottom, rear, right, or left side as required.

4.4 ACCESSORIES. Where continuous wall-to-wall installations are indicated, all necessary accessories shall be provided. These accessories shall include, but not be limited to, corner fittings, fillers, splice plates, and end caps. There shall be no sharp edges, and accessories shall have the same profile as the basic unit. Provision shall be made for expansion of enclosure.

4.5 LIMIT CONTROLS. Continuous end-to-end automatic reset thermal overheat line voltage protection shall be provided with each individual baseboard heater to prevent overheating.

4.6 WIRING. Baseboard unit shall be furnished complete, factory prewired and ready for branch circuit and control connections.

4.7 DISCONNECT MEANS. Each heater shall be provided with a factory-installed safety disconnect switch or circuit breaker installed in the housing or in an auxiliary matching control section.

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PT

ZERO ACCIDENTS

SECTION 16C
CATHODIC PROTECTION (GALVANIC ANODE TYPE)

INDEX

Attachments: Anode Current Output Record
Std. Dwg. 40-06-15, Sheets 1, 2, 3, 4 and 5

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 FEDERAL SPECIFICATIONS (Fed. Spec.).

J-C-30A & Am-1	Cable and Wire, Electrical (Power, Fixed Installation)
HH-I-595C	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

1.2 MILITARY SPECIFICATION (Mil. Spec.).

MIL-B-7883B	Brazing of Steels, Copper, Copper Alloys, Nickel Alloys, Aluminum and Aluminum Alloys

1.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

D 1248-81a	Polyethylene Plastics Molding and Extrusion Materials

1.4 NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE) PUBLICATION.

RP-01-69	Recommended Practice-Control of External Corrosion on Underground or Submerged Metallic Piping System (Rev. 1976)

1.5 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) STANDARD.

WC-5-1973 Incl Rev. 1 thru 10 (R 1979)	Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

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2. GENERAL. The contract drawings indicate the extent and general arrangement of the waterlines, valves, and fire hydrants. The cathodic protection system for the waterlines, valves, and fire hydants shall be as specified herein. The electrical isolation, coating and/or wrapping of underground facilities, when not specified elsewhere, shall be included as a part of this section of these specifications, and shall be in accordance with NACE RP-01-69. This specification applies to metal structures that are coated, covered, or coated and wrapped.

2.1 STANDARD PRODUCTS. Materials and equipment submitted for approval shall be a product of a manufacturer regularly engaged in the manufacture of the product, shall meet the requirements of the specifications, and essentially duplicate materials and equipment that have been in satisfactory use at least 2 years prior to bid opening.

2.2 VERIFICATION OF SITE CONDITIONS. The Contractor shall coordinate and properly relate his work to the site and to the work of all trades. The general locations of the lines to receive protection are shown. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, shall verify existing conditions in the field, determine the exact locations of lines to be protected, and advise the Contracting Officer of any discrepancy before performing any work.

2.3 INSTALLATION METHODS. The system installed shall comply with the applicable portions of NACE Standard RP-01-69.

3. MATERIALS AND EQUIPMENT shall conform to the respective specifications and other requirements specified herein.

3.1 ANODES.

3.1.1 Dimensions of magnesium anodes shall conform to the dimensions for standard sizes of anodes of the weights specified. The magnesium anode shall be of H-1, grade A alloy, conforming to the following:

Aluminum	5.3 - 6.7%
Manganese, min.	0.15
Zinc	2.5 - 3.5
Silicon, max.	0.10
Copper, max.	0.02
Nickel, max.	0.002
Iron, max.	0.003
Other impurities	0.3
Magnesium	Remainder

Contractor shall furnish spectographic analyses or a letter of compliance on samples from each heat or batch of anodes used on this project.

3.1.2 Anodes shall be provided with specified backfill in a cloth sack. Anodes shall be centered in the backfill material. The total weight of the packaged anode shall be approximately as follows:

17 lb bare anode - 45 lb packaged anode

The backfill material shall consist of 75 percent gypsum, 20 percent bentonite, and 5 percent sodium sulfate, and shall be of the quick-wetting type.

3.1.3 Anode lead wires shall consist of insulated No. 12 solid copper wire. Lead wires shall be 10 feet in length.

3.2 BRAZING shall be in accordance with "Torch Brazing" requirements of Military Specification MIL-B-7883.

3.3 CONDUCTORS shall be copper except resistance wire and may have any of the following insulation types.

3.3.1 Type TW and USE Insulation shall comply with Fed. Spec. J-C-30.

3.3.2 Polyethylene Insulation. Cathodic protection cable specifically made for the purposes shall comply with ASTM D 1248 and shall be high molecular weight polyethylene, Type I, Class C, Grade E5, or NEMA WC-5, polyethylene insulation.

3.4 TAPE. Electrical tape pressure sensitive vinyl plastic shall comply with Fed. Spec. HH-I-595.

3.5 BACKFILL SHIELD MATERIAL shall be composed of approved pipeline wrapping or fiberglass reinforced coal-tar impregnated tape, or plastic weld caps specifically made for the purpose and installed in accordance with the manufacturer's directions.

3.5.1 Pipe Joint Cover for steel pipe shall be as shown on Standard Drawing 40-06-15, Sheet 5, Coal tar wrap.

3.6 CURB BOX shall be a manufacturer's standard product of cast iron or plastic and shall be complete with insulated two contact terminal strip and a lockable cover with "C.P. Test" label on cover.

3.7 COATING COMPOUND shall be cold applied coal-tar base mastic, hot-applied coal-tar enamel, or approved pipeline wrapping.

3.8 RESISTANCE WIRE shall be insulated type TW insulated nichrome wire, Agra #16 or #22.

3.9 WELDING of electrical connections shall be as follows:

3.9.1 Exothermic type "Cadweld" or Burndy "Thermoweld," installed as directed by the manufacturer.

3.9.2 Other methods of welding specifically approved by the pipe manufacturer.

4. SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit for approval, data as specified herein on the following:

4.1 CATEGORY I.

Conductors
Anodes
Cold-applied bituminous coating material
Backfill shield material
Insulated resistance wire
Layout of Anodes
Layout of anodes around tanks
Special details
Certified qualifications and experience data of installing firm and supervisor
Exothermic weld equipment and material
Curb box for test lead station
Welding method for electrical connections
Electrical isolation material, method and locations
Certifications showing:

Data on installing firm to include:

1. Name of the firm
2. The number of years of experience
3. A list of not less than five of the firm's installations that are at least 3 years old which have been tested and found to be satisfactory

Data showing name and qualifications of the installing supervisor

4.2 CATEGORY II. None.

5. WORKMANSHIP. The installation shall be supervised by a NACE Accredited Corrosion Specialist or Senior Corrosion Technologist. All materials and equipment shall be installed in accordance with the recommendations of the manufacturer as approved by the Contracting Officer to conform with the contract documents. The supervisor, as specified above, shall be on the site at least three times during construction and testing; once at the start of construction, once at approximately the mid-point of construction, and during the testing.

6. ANODE PROTECTION AND INSTALLATION.

6.1 PROTECTION. Storage area for magnesium anodes will be designated by the Contracting Officer. Anodes shall have approved waterproof protection at all times prior to installation. Damaged anodes shall be replaced. Remove waterproof protection before installing anode.

6.2 INSTALLATION. Unless otherwise authorized, installation shall not proceed without the presence of a representative of the Contracting Officer. Anodes of the size indicated herein shall be installed at the locations indicated herein. Locations may be changed to clear obstructions with the approval of the Contracting Officer.

6.2.1 Anode Placement - General. Packaged anodes shall be installed completely dry, and shall be lowered into holes by rope sling or by grasping the cloth gather. The anode lead wire shall not be used in lowering the anodes. The hole shall be backfilled with fine soil in 6-inch layers and each layer shall be hand tamped around the anode. Care must be exercised not to strike the anode or lead wire with the tamper. If immediate testing is to be performed, water shall be added only after backfilling and tamping has been completed to a point 6 inches above the anode. Approximately 5 gallons of water may be poured into the hole. After the water has been absorbed by the soil, backfilling and tamping may be completed to the top of the hole. Anodes shall be installed as shown on Std Dwg 40-06-15. In the event a rock strata is encountered prior to achieving specified augered-hole depth, anodes may be installed horizontally to a depth at least as deep as the bottom of the pipe, with the approval of the Contracting Officer.

6.2.2 Underground Pipe Line. The 6-inch ductile cast iron line shall have three 17-lb. anodes spaced at equal intervals. The 8-inch ductile cast iron line shall have twelve 17-lb. anodes spaced at equal intervals. The 10-inch ductile cast iron line shall have fifteen 17-lb. anodes spaced at equal intervals. The 12-inch ductile cast iron line shall have eighty six 17-lb. anodes spaced at equal intervals. The 16-inch ductile cast iron line shall have 112 17-lb. anodes spaced at equal intervals. Anodes shall be installed at a minimum of 3 feet and a maximum of 10 feet from the line to be protected.

ORIGINAL (Red)

7. LEAD WIRE CONNECTIONS FOR ANODE AND TEST STATION.

7.1 UNDERGROUND PIPELINE. Lead wire-to-structure connections shall be accomplished by exothermic welding process. A backfill shield shall be placed over each connection and shall be of dimensions adequate to cover the exposed metals.

7.2 LEAD AND RESISTANCE WIRE SPLICES. All lead wire splicing, when necessary, shall be welded. The joint shall be epoxy insulated. Resistance wire connections shall be accomplished with silver solder and wrapped with a minimum of three layers of pressure sensitive tape.

8. TEST STATIONS shall be installed at the following locations.

8.1 At intervals not exceeding 300 feet, provide one test lead.

8.2 Where the pipe crosses within 6 inches of any other metal pipe, provide two test leads. Test leads will not be required within 300 feet of a riser pipe or any place where the pipe may be readily accessible.

8.3 Where a carrier pipe is used under roads or railroads, etc., or elsewhere, the second test lead shall be connected to the carrier pipe and the first test lead connected to the protected structure.

8.4 Provide a two wire test station at underground insulating joints [electrically isolating joint]. Connect a lead to each side of the joint.

8.5 Conductors shall be #12 AWG insulated, color coded as required. The upper end of the test station conductors shall be insulated with plastic tape or an insulated wire nut connector.

8.6 Stations shall be as shown on Std. Dwg. 40-06-15. The curb box test station shall have a 12-inch by 12-inch by 3-inch thick concrete pad poured around the test station flush with the grade.

9. UNDERGROUND PIPE JOINT BONDS. All metal pipe joints except welded joints shall be electrically bonded. Bonding shall be made to the pipe on both sides of the joint and all component parts of the pipe joint except bolts. Joint bond conductor of #2 AWG on copper lines and #1/0 on ductile cast iron lines. Both will be TW insulated.

10. ELECTRICAL ISOLATION OF STRUCTURES.

10.1 WATERLINES. Provide electrical isolation between new and existing piping and at other points where a short to another pipe or a foreign structure may occur.

11. TRENCHING AND BACKFILLING shall be accomplished in accordance with SECTION: EXCAVATION, TRENCHING AND BACKFILLING FOR UTILITIES SYSTEMS and as shown on the drawings.

12. SEEDING shall be accomplished in accordance with SECTION: SEEDING in locations disturbed by this construction.

13. TESTS AND MEASUREMENTS. Unless otherwise authorized, tests shall not be made without the presence of a representative of the Contracting Officer.

13.1 ANODE TESTING - UNDERGROUND PIPELINE. Prior to connection of the anode lead wire to the structure, and after backfilling around the anode and structure, a milliammeter will be inserted in the circuit and the current

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output of each anode measured and recorded. In the event that maximum current outputs, as set forth below, for the different sizes of anodes should be exceeded, adequate resistance wire shall be inserted in the circuit to reduce the current output to the maximum allowable for a given size anode. Maximum allowable current outputs for the different size anodes to allow for design life shall be as shown in Table I below.

13.2 MAXIMUM CURRENT TABLE. Anodes of the various weights when tested shall not allow more than the following respective maximum current output.

TABLE I

Weight Bare Anode	Allowable Current Output
17# Anode	0.040 Amperes

13.3 INSULATION TESTING. At the time of anode installation, testing will be conducted at each insulating fitting to determine that no electrical contact or "short" exists between the two insulated structures. The Contractor shall be responsible for electrical isolation of all new structures. This phase of testing will be conducted utilizing a battery compass apparatus or other device specifically manufactured for this purpose. Insulated connections installed under this contract and found to be shorted shall be replaced by the Contractor.

13.4 STRUCTURE-TO-SOIL POTENTIAL MEASUREMENTS. Upon completion of the cathodic protection installation, structure-to-soil potential measurements, with a copper/copper sulfate reference electrode, and using a potentiometer-voltmeter with a minimum internal resistance of 100,000 ohms, shall be made as follows:

13.4.1 Coated Piping.

13.4.1.1 With the test equipment properly connected and positioned, acquire potential readings at intervals not to exceed 300 feet. The reference electrode shall be positioned over the structure midway between anode locations. Acquire at least two potential measurements at each water service.

13.4.2 Protective Criteria For Electrically Isolated Structures. Potential for protection of structures shall be a minimum of negative 0.85 volt as measured between the structure and a saturated copper-copper sulphate reference cell contacting the earth directly over the structure.

13.4.3 Recording Measurements. All structure-to-soil potential measurements including native state potentials, and current measurements, shall be prepared in tabular form, and submitted in six copies, with each location identified on the as-built drawings. Contractor shall locate and correct and report to Contracting Officer any shorts to foreign structures encountered during checkout of the installed cathodic protection system. Structure-to-soil potential measurements are required on as many structures as necessary to determine the extent of protection or locate shorts.

13.5 INSUFFICIENT PROTECTION. In the event that the system, when installed in accordance with the plans and specifications, will not provide the required protection of negative 0.85 volt, the Contractor, together with the Contracting Officer, shall determine the cause and corrections needed.

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The Contractor shall be responsible for electrical isolation of all new piping, tanks, conduits, etc., in this contract. After the needed corrective actions have been so determined, the contract will be modified in accordance with paragraph 3 of the General Provisions and the Contractor shall perform the additional work to provide at least a negative 0.85 volt protection for the system.

13.6 INTERFERENCE TESTING shall be made on all structures installed under this contract to locate damage being caused by existing impressed current cathodic protection systems or other sources of interference. It shall be the Contractor's responsibility to correct all interference using methods recommended by the Corrosion Technologist or Specialist. The methods used shall be shown on the as-built drawings and described in the test report.

14. CLEANUP. Contractor shall be responsible for cleanup at each anode installation site. All paper bags, wire clippings, etc., shall be disposed of as the Contracting Officer directs. Paper bags, wire clippings and other waste will not be put in bell hole or anode excavation.

15. MANUAL. The Contractor shall prepare and furnish the Contracting Officer six copies of operation and maintenance manual of the cathodic protection system for guidance of Using Agency personnel. The manual shall be prepared with the following contents.

Part I - General Section

Section 1	How Metals Corrode in the Ground
Section 2	How Cathodic Protection Prevents Corrosion
Section 3	How Cathodic Protection is Applied to Buried Metals
Section 4	When to Measure Structure-to-Soil Potentials
Section 5	Limitations of Cathodic Protection
Section 6	How to Measure Structure-to-Soil Potentials

Part II - Description of the Cathodic Protection System

Section 1	Galvanic anode system. Include a complete anode installation record to show size of each anode, whether under earth or pavement, and type of structure or utility line to which attached.
Section 2	As-built Drawings. The drawings shall be prepared to a scale approved by the Contracting Officer and shall contain dimensioned locations of anodes, soil potential measurements, test stations, bonding connections, insulated joints, and other underground structures.

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ANODE CURRENT OUTPUT RECORD

Location: _____ Sheet __ of __ Date: _____

Anode Size	LOCATION (Refer to Bldg. Nos., Streets, Std. or Permanent Landmarks)	Gas	STRUCTURE Tank	Current Output

NOTE: Explanatory remarks, if required, can be entered on back of form.

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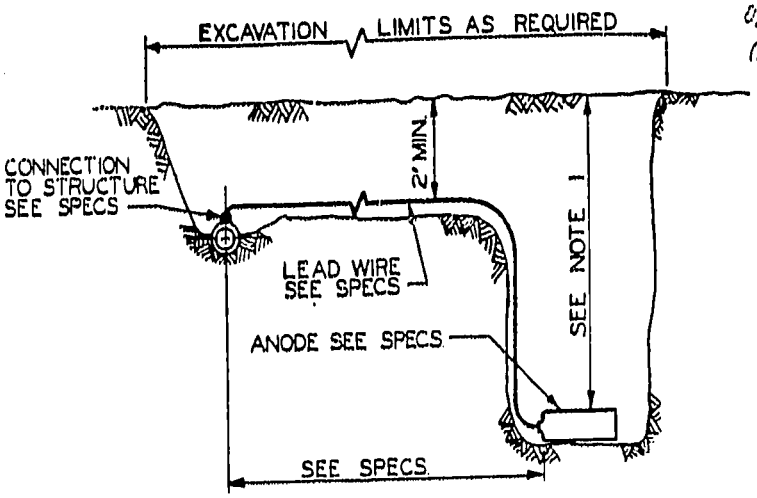
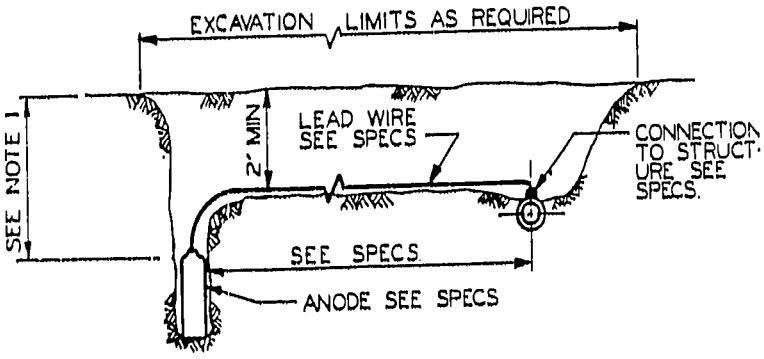


HORIZONTAL



VERTICAL

NOTES:

1. Anode to be installed at a depth equal to or exceeding depth of structure but in no case less than 3'-0".

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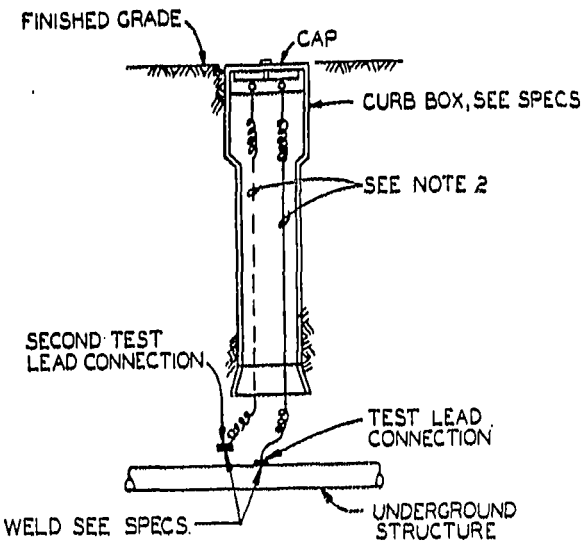
GALVANIC ANODE INSTALLATION

REVISED FEB. 1973
DWG NO. 40-06-15 SH. 1



DETAIL "E"

NOTES:

1. Provide this test station when specified on the contract drawings, or in the Specifications, or as directed.

2. Provide one test lead unless otherwise noted. Leads shall be color coded.

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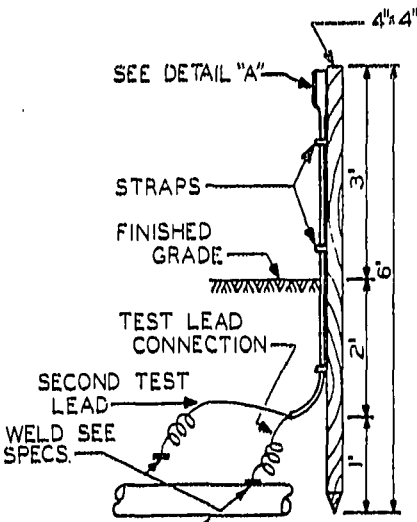
FLUSH TEST STATION

REVISED FEB. 1973

DWG NO. 40-06-15 SH. 2

CORROSION CONTROL STD. DWG.



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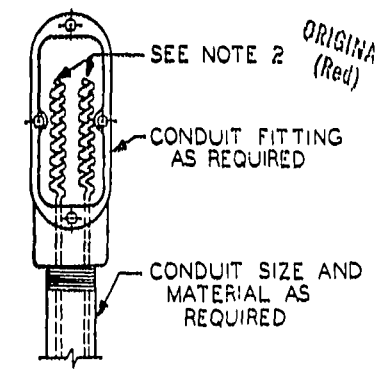

DETAIL "A"

ORIGINAL (Red)

NOTES:

1. Provide this test station when specified on the contract drawings, or in the Specifications, or as directed.

2. Provide one test lead unless otherwise noted. Leads shall be color coded.

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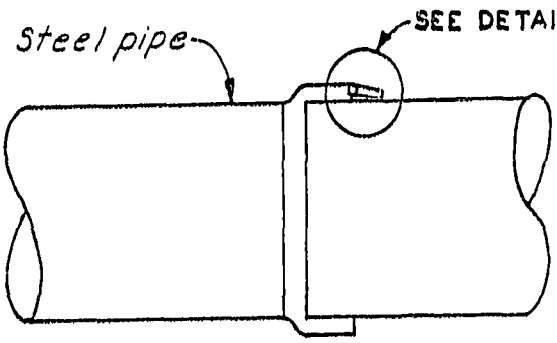
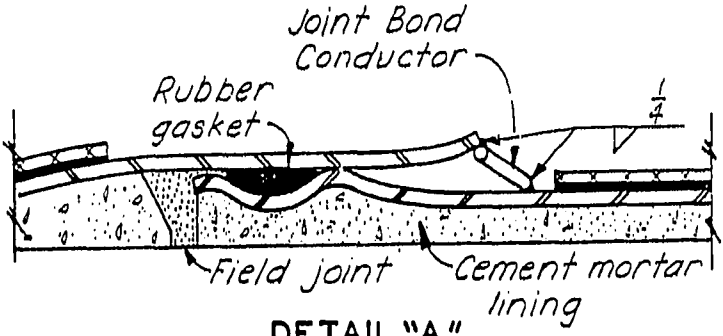
ELEVATED TEST STATION

REVISED FEB. 1973

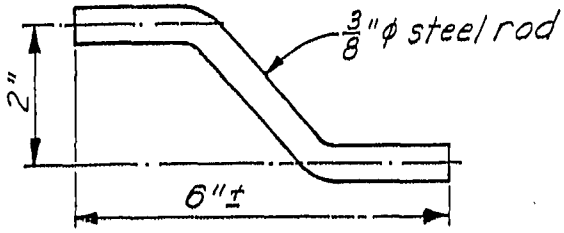
CORROSION CONTROL STD. DWG. DWG. NO. 40-06-15 SH. 3



ELEVATION



DETAIL "A"



JOINT BOND CONDUCTOR

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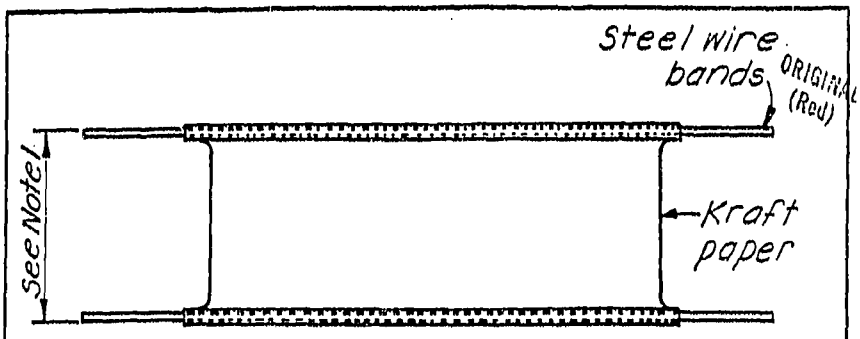
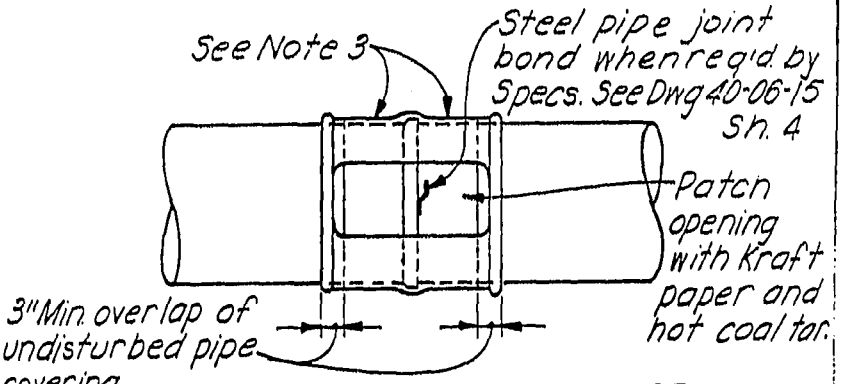
STEEL PIPE JOINT BOND

REVISED FEB. 1973
DWG. NO. 40-06-15 SH. 4

CORROSION CONTROL STD. DWG.



PLAN-PAPER JOINT COVER



PAPER JOINT COVER IN PLACE

NOTES:

1. Width as required to provide overlap of 3 inches each side as indicated.
2. Fill joint cover with hot coal tar enamel from one side only until the air is exhausted and cover is filled.
3. Outer wrap shall be stripped back not less than 3 inches each side of joint to allow maximum bond of the new tar to existing tar coating.

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STEEL PIPE JOINT COVER

REVISED FEB 1978

CORROSION CONTROL STD. DWG. DWG.NO. 40-06-15 SH. 5

Project No. C1[illegible]
Dis[illegible]B

ORIGINAL (Red)

ZERO ACCIDENTS

SECTION 16D
CATHODIC PROTECTION SYSTEM
(IMPRESSED CURRENT)

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

1.1 MILITARY SPECIFICATION (MIL. SPEC.).

MIL-I-1361B & Am-1	Instrument, Auxiliaries, Electrical Measuring, Shunts, Resistors, and Transformers

1.2 AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) STANDARD.

C97.1-1972	Low-Voltage Cartridge Fuses 600 Volts or Less

1.3 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS.

A 53-82	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
D 1248-81a	Polyethylene Plastics Molding and Extrusion Materials

1.4 NATIONAL ASSOCIATION OF CORROSION ENGINEERS (NACE) PUBLICATION.

RP-01-69	Recommended Practice-Control of External Corrosion on Underground or Submerged Metallic Piping Systems (Rev 1976)

1.5 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) STANDARDS.

PV 3-1973 (R 1979)	Safety Code for Semiconductor Power Convertors
ST 1-1978	Specialty Transformers (Except General-Purpose Type)
TC 2-1978 Incl Rev 1 thru 4	Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80)
TR 1-1980 Incl Rev 1 and 2	Transformers, Regulators and Reactors

	WC 5-1973 (R 1979) Incl Rev 1 thru 10	Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

1.6 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARD.

No. 70-1984	National Electrical Code

1.7 UNDERWRITERS LABORATORIES, INC. (UL) PUBLICATIONS.

UL 6	Rigid Metal Conduit (Oct 23, 1981, 9th Ed.)
UL 467	Grounding and Bonding Equipment (Nov 7, 1972, 5th Ed.; Rev thru Mar 26, 1982)
UL 506	Specialty Transformers (Dec 26, 1979, 9th Ed.; Rev thru Jul 12, 1982)
UL 510	Insulating Tape (Jan 26, 1982, 5th Ed.; Rev Mar 16, 1982)
UL 514	Outlet Boxes and Fittings (May 14, 1979, 6th Ed.; Rev thru Jun 1, 1982)

2. GENERAL REQUIREMENTS.

2.1 SERVICES OF CORROSION ENGINEER. The Contractor shall obtain the services of a corrosion engineer to supervise and inspect the installation of the cathodic protection system. Corrosion Engineer refers to a person who, by reason of his knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control on buried or submerged metallic piping systems and metallic tanks. Such person may be a licensed professional engineer or may be a person certified as being qualified by the National Association of Corrosion Engineers if such licensing or certification includes suitable experience in corrosion control or buried or submerged metallic piping systems and metallic tanks.

2.1.1 Evidence of qualifications of the corrosion engineer shall be submitted by the Contractor.

2.1.2 The corrosion engineer shall insure that the cathodic protection system is installed, tested, and placed into service in accordance with the requirements specified.

2.2 RULES. The installation shall conform to the applicable rules of NFPA No. 70.

3. SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit data as specified herein on the following:

3.1 CATEGORY I. None

3.2 CATEGORY II.

3.2.1 Certified test results stating the maximum recommended anode current output density and the rate of gaseous production if any at that current density.

3.2.2 Complete wiring and schematic diagrams.

3.2.3 Operating and maintenance instructions.

3.2.4 Spare parts data with current unit prices and source of supply.

3.2.5 Performance test reports of all field tests and measurements in booklet form.

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ORIGINAL (Red)

3A. TRAINING COURSE. The Contractor shall conduct a training course for operating staff as designated by the Contracting Officer. The training period shall consist of a total of 8 hours of normal working time and shall start after the system is functionally completed but prior to final acceptance tests.

4. IMPRESSED CURRENT ANODES.

4.1 BARE HIGH SILICON CAST IRON ANODES. Cast iron anodes shall be of the size indicated and shall conform to the following requirements:

4.1.1 Chemical Composition (Nominal).

	Percent by Weight	
Element	Grade 1	Grade 2
Silicon	14.20-14.75	14.20-14.75
Manganese	1.50 Max	1.50 Max
Carbon	0.70-1.10	0.75-1.15
Chromium	----------	3.25-5.00
Iron	Balance	Balance

4.1.2 Electrical Resistivity. Seventy-two microhm-centimeter at 20 degrees F.

4.1.3 Physical Properties (Nominal).

Tensile strength	15,000 psi
Compressive strength	100,000 psi
Brinell hardness	520
Density	7.0 grams per cubic centimeter
Melting point	2300 degrees F.
Coefficient of expansion from 32 to 212 degrees F.	0.00000733 centimeter per degree F.

4.2 CANISTER CONTAINED ANODES. Canister contained anodes shall be packed at the factory in sheet metal canisters with calcined petroleum coke breeze or metallurgical coke breeze and the canisters shall be capped with tight fitting end caps secured to the body of the canister. The canister size shall be such that there is a minimum annular space of 3 inches all around the anode. The connecting cable shall pass through a hole in an end cap designed to be tight fitting with the cable and protected from sharp edges with a plastic or rubber grommet. The anodes shall be centered in the canisters and the annular space filled with coke breeze compacted in place.

4.3 ANODE CONNECTING CABLES.

4.3.1 Anodes shall have connecting cables installed at the factory. The connecting method shall be such that it can be demonstrated to pass a 120-day laboratory test without failure at the place of connection wherein the anode is subjected to maximum recommended current output while immersed in a 3 percent sodium chloride solution.

4.3.2 For deep well ground bed, each anode located in the well shall be accompanied by a reel of continuous cable having the length indicated. No spliced connections shall be permitted in deep well cables.

5. RECTIFIERS AND ASSOCIATED EQUIPMENT.

5.1 RECTIFIER UNIT. Rectifier unit shall consist of a transformer, rectifying elements, transformer tap adjuster, terminal block, one combination voltammeter, one toggle switch for each meter, fuse holders with fuses for each dc circuit, variable resistors, an ac power-supply circuit breaker, lightning arresters for both input and output, all wired and assembled in a weatherproof metal cabinet. The overall efficiency of the rectifier shall be not less than 65 percent when operated at nameplate rating and shall be capable of supplying continuous full rated output at an ambient temperature of 112 degrees F. in full accordance with expected life in excess of 10 years.

5.1.1 Transformer shall conform to UL 506 and ANSI C57.12, or NEMA TR-1, as applicable.

5.1.2 Rectifying elements shall conform to NEMA SP 3, and shall be silicon diodes or selenium cells connected in such manner as to provide full-wave rectification. Silicon diodes shall be protected by selenium surge cells or varistors against peak-voltage surges and by current limiting devices against overcurrent surges.

5.1.3 Meters shall be accurate to within plus or minus 2 percent of full scale at 80 degrees F., and shall possess temperature stability above and below 80 degrees F. of at least 1 percent per 10 degrees F. Separate meters shall be 2-1/2-inch nominal size or larger.

5.1.4 A four-pole, trip-operated, fully magnetic, properly rated non-thermal type circuit breaker shall be installed in the primary circuit of the rectifier supply transformer.

5.1.5 Cartridge-type fuses conforming to ANSI C37.1 with suitable fuse holders shall be provided in each leg of the dc circuit.

5.2 CABINET. Cabinet shall be constructed of not lighter than No. 16-gage steel, and shall be provided with a full door. The door shall be hinged and have a hasp that will permit the use of a padlock. The cabinet shall be fitted with louvered openings of the proper size to provide for adequate cooling. Holes, conduit knockouts, or threaded hubs of sufficient size and number shall be conveniently located.

5.2.1 A complete wiring diagram of the power unit showing both the ac supply and the dc connections to anodes shall be on the inside of the cabinet door. All components shall be shown and labeled.

5.2.2 The wiring provisions shall comply with NFPA No. 70 and UL 467 including a grounding terminal in the cabinet. The grounding conductor from the terminal to the earth grounding system shall be solid or stranded copper of one or more 5/8-inch diameter copper-clad steel rods. Ground rods shall be 8-feet long minimum.

5.2.3 The cabinet and supporting mounting shall be painted with the manufacturer's standard paint system.

5.3 WIRING. Wiring shall be installed in accordance with NFPA No. 70 utilizing type TW or RHW or polyethylene insulation. Fittings for conduit and cable work shall conform to UL 514. Outlets shall be of the threaded hub type with gasketed covers. Conduit shall be securely fastened at 8-foot intervals or less. Splices shall be made in outlet fittings only. Conductors shall be color coded for identification.

5.4 OIL IMMERSED ENCLOSURES. Enclosures shall be of 11-gage steel or heavier, with an accessible drain plug. The oil level shall be clearly marked. The lid shall be hinged and have quick-release clamps to secure it

in closed position. A stop shall limit the swing of the lid when opened. A compressible, oil resistant, positive sealing gasket shall be provided. The gasket shall return to its original shape upon release of lid pressure. The gasket shall be attached to the tank or lid and joints shall be free of gaps. Base mounting using 4-inch high channels shall be provided.

6. COKE BREEZE.

6.1 CALCINED PETROLEUM COKE BREEZE (DRY). Breeze shall conform to the following requirements:

6.1.1 Electrical Resistivity.
1.0 to 2.0 ohm-centimeter - tightly compacted
10 to 15 ohm-centimeter - loosely compacted

6.1.2 Bulk Density. 48 to 74 pounds per cubic foot.

6.2 METALLURGICAL COKE BREEZE (PROCESSED). Breeze shall conform to the following requirements:

6.2.1 Electrical Resistivity (Nominal).
10 ohm-centimeter - Max., tightly compacted
10 to 15 ohm-centimeter - lightly compacted
15 to 20 ohm-centimeter - loose

6.2.2 Bulk Density. 38-42 pounds per cubic foot.

7. MISCELLANEOUS MATERIALS.

7.1 ELECTRICAL WIRE.

7.1.1 Anode connecting wire shall be No. 8 AWG stranded copper wire with type CP high molecular weight polyethylene insulation, 7/64-inch thick, 600-volt rating, in accordance with NEMA WC 5. Cable-to-anode contact resistance shall be 0.003 ohms maximum.

7.1.2 Cable for anode header and distribution shall be No. 8 AWG stranded copper wire with type CP high molecular weight polyethylene, 7/64-inch thick insulation, 600-volt rating, in accordance with NEMA WC 5.

7.1.3 Test wires shall be AWG No. 12 stranded copper wire with NFPA No. 70 Type TW or RHW or polyethylene insulation.

7.1.4 Resistance wire shall be AWG No. 16 or No. 22 nickel-chromium wire.

7.2 CONDUIT. Rigid galvanized steel conduit and accessories shall conform to UL 6. Non-metallic conduit shall conform to NEMA TC 2.

7.3 TEST BOXES AND JUNCTIONS BOXES. Boxes shall be outdoor type conforming to UL 514.

7.4 POLYETHYLENE INSULATION. Polyethylene insulation shall comply with the requirements of ASTM D 1248 and of the following types, classes, and grades:

7.4.1 High molecular weight polyethylene shall be Type I, Class C, Grade E5.

7.4.2 High density polyethylene shall be Type III, Class C, Grade E3.

7.5 TEST STATIONS. Test stations shall be complete with an insulated terminal block having the indicated number of terminals and shall be provided with a lockable cover.

7.6 CALIBRATED SHUNTS. Shunts shall conform to Mil. Spec. MIL-I-1361.

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7.7 JOINT, PATCH, SEAL, AND REPAIR COATING.

7.7.1 Sealing and dielectric compound shall be a black, rubber based compound that is soft, permanently pliable, tacky, moldable, and unbacked. Compound shall be applied as recommended by the manufacturer, but not less than 1/8-inch thick.

7.7.2 Coating compound shall be cold-applied coal-tar base mastic, hot-applied coal-tar enamel, or an approved pipeline wrapping.

7.7.3 Preformed sheaths for encapsulating electrical wire splices to be buried underground shall fit the insulated wires entering the spliced joint.

7.7.4 Epoxy potting compound for encapsulating electrical wire splices to be buried underground shall be a two package system made for the purpose.

7.7.5 Backfill shields shall consist of approved pipeline wrapping or fiberglass reinforced, coal-tar impregnated tape, or plastic weld caps, specifically made for the purpose.

7.7.6 Pressure-sensitive vinyl plastic electrical tape shall conform to UL 510.

8. GROUND BED INSTALLATION.

8.1 SHALLOW GROUND BEDS. Shallow ground beds shall contain size and quantity of anodes designed to meet performance criteria of the cathodic protection system at an initial operating current output density not exceeding 40 percent of maximum recommended current output density.

8.1.1 Vertically buried bare anodes shall be installed in vertical holes in the ground having a depth, spacing, and location shown. The holes in the ground shall be sufficiently large to provide an annular space around the anode not less than 4 inches. The anodes shall be centered in the hole and backfilled with calcined petroleum coke breeze or metallurgical coke breeze. Backfill shall be compacted.

8.1.2 Vertically buried canister-contained anodes shall be installed in vertical holes in the ground having depth, spacing, and locations shown. The holes in the ground shall be sufficiently larger in diameter than the canisters to facilitate easy lowering into the hole and backfilling. The space between the canister and the wall of the hole shall be completely backfilled with a wet slurry of earth free of stones.
the tank to be protected shall be buried a minimum depth of 30 inches except where above ground construction utilizing conduit is used.

9. MISCELLANEOUS INSTALLATION.

9.1 RECTIFIER INSTALLATION. Mounting shall be as shown. Wall mounting shall be equipped with a channel bracket, lifting eyes, and a keyhole at the top.

9.2 WIRE CONNECTIONS.

9.2.1 Connecting wire splicing shall be made with copper compression connectors or exothermic welds, following instructions of the manufacturer. Split-bolt type connectors shall not be used.

9.2.2 Connections to metal tanks shall be made by exothermic weld methods as manufactured by an approved manufacturer for the type of tank.

9.2.3 Electric arc welded connections and other types of welded connections to ferrous pipe and structures shall be approved before use.

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9.3 TEST STATIONS. Test stations shall be of the type and location shown and shall be curb box mounted. Buried electrically insulating joints shall be provided with test wire connections brought to a test station. Changes in designated location must have prior approval.

10. CRITERIA OF PROTECTION. Criteria for determining the adequacy of protection on a buried tank shall be in accordance with NACE RP-01 and shall be selected by the corrosion engineer as applicable.

10.1 IRON AND STEEL. One of the following methods shall apply:

10.1.1 A negative voltage of at least minus 0.85 volts as measured between the tank and a saturated copper-copper sulphate reference electrode contacting the earth next to the tank. Determination of this voltage shall be made with the cathodic protection system in operation.

11. TESTS AND MEASUREMENTS.

11.1 BASELINE POTENTIALS. After backfill of the tank and anodes is completed, but before the anodes are connected to the tank, the static potential-to-soil of the tank shall be measured. The locations of these measurements shall be identical to the locations specified for tank-to-reference electrode potential measurements. The initial measurements shall be recorded.

11.2 INSULATION TESTING. Before the anode system is connected to the tank, an insulation test shall be made at each insulating joint or fitting. This test shall demonstrate that no metallic contact, or short circuit exists between the two insulated sections of the tank. Any insulating fittings installed and found to be defective shall be reported to the Contracting Officer.

11.3 ANODE OUTPUT. As the anodes or groups of anodes are connected to the tank, current output shall be measured with an approved low resistance ammeter. The values obtained and the date, time, and locations shall be recorded.

11.4 TANK-TO-REFERENCE ELECTRODE POTENTIAL MEASUREMENTS. Upon completion of the installation and with the entire cathodic protection system in operation, electrode potential measurements shall be made using a copper-copper sulphate reference electrode and a potentiometer-voltmeter, or a direct current voltmeter having an internal resistance (sensitivity) of not less than 100,000 ohms per volt and a full scale of one or two volts. The locations of these measurements shall be identical to the locations used for baseline potentials. The values obtained and the date, time, and locations of measurements shall be recorded.

11.5 LOCATION OF MEASUREMENTS.

11.5.1 For coated piping or conduit, measurements shall be taken from the reference electrode located in contact with the earth, directly over the pipe. Connection to the pipe shall be made at service risers, valves, test leads, or by other means suitable for test purposes. Measurements shall be made at intervals not exceeding 400 feet. In no case shall less than three measurements be made over any length of line. Additional measurements shall be made at each distribution service riser, with the reference electrode placed directly over the service line.

11.5.2 For tanks, measurements shall be taken at least 12 places evenly spaced around the tank.

11.6 INTERFERENCE TESTING. Before final acceptance of the installation, interference tests shall be made with respect to any foreign pipes in cooperation with the owner of the foreign pipes. A full report of the tests giving all details shall be made.

11.7 RECORDING MEASUREMENTS. All tank-to-soil potential measurements including initial potentials where required shall be recorded. Contractor shall locate and correct and report to Contracting Officer any short circuits to foreign pipes encountered during checkout of the installed cathodic protection system. Pipe-to-soil potential measurements are required on as many pipes as necessary to determine the extent of protection or to locate short-circuits.

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ZERO ACCIDENTS

SECTION 16E
CATHODIC PROTECTION SYSTEM
(STEEL WATER TANKS)

INDEX

1. APPLICABLE PUBLICATIONS. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1.1 MILITARY SPECIFICATION (Mil. Spec.).

MIL-I-1361B & Am-1	Instrument, Auxiliaries, Electrical Measuring, Shunts, Resistors, and Transformers

1.2 AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATION.

D 1248-81a	Polyethylene Plastics Molding and Extrusion Materials

1.3 NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA) STANDARDS.

FU 1-1978	Low Voltage Cartridge Fuse
MR 20-1958 (1976)	Cathodic Protection Units
PV 3-1973 (R 1979)	Safety Code for Semiconductor Power Convertors
ST 1-1978	Specialty Transformers (Except General-Purpose Type)
TC 2-1978 Incl Rev 1 thru 4	Electrical Plastic Tubing (EPT) and Conduit (EPC 40 and EPC 80)
TR 1-1980 Incl Rev 1 & 2	Transformers, Regulators, and Reactors
WC 5-1973 (R 1979) Incl Rev 1 thru 10	Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy

1.4 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA) STANDARD.

No. 70-1984	National Electrical Code

1.5 UNDERWRITERS LABORATORIES, INC., (UL) PUBLICATIONS.

UL 6	Rigid Metal Conduit (Oct 23, 1981, 9th Ed.)

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UL 467	Grounding and Bonding Equipment (Nov 7, 1972, 5th Ed., Rev. thru May 26, 1982)
UL 506	Specialty Transformers (Dec 26, 1979, 9th Ed., Rev. thru July 12, 1982)
UL 510	Insulating Tape (Jan 26, 1982, 5th Ed., Rev. Mar 16, 1982)
UL 514	Outlet Boxes and Fittings (May 14, 1979, Rev. thru June 1, 1982)

2. GENERAL REQUIREMENTS.

2.1 SERVICES OF CORROSION ENGINEER. The Contractor shall obtain the services of a corrosion engineer to supervise and inspect the installation of the cathodic protection system. Corrosion Engineer refers to a person who, by reason of his knowledge of the physical sciences and the principles of engineering and mathematics, acquired by professional education and related practical experience, is qualified to engage in the practice of corrosion control on steel water tanks. Such person may be a licensed professional engineer or may be a person certified as being qualified by the National Association of Corrosion Engineers if such licensing or certification includes suitable experience in corrosion control on steel water tanks.

2.1.1 Evidence of qualifications of the corrosion engineer shall be submitted to the Contractor.

2.1.2 The corrosion engineer shall ensure that the cathodic protection system is installed, tested, and placed into service in accordance with the requirements specified.

2.2 RULES. The installation shall conform to the applicable rules of NFPA No. 70.

3. SUBMITTALS.

3.1 DETAIL DRAWINGS. Detail drawings of the proposed cathodic protection installation as required under Category I submittals shall be submitted for approval concurrently with or prior to the other Category I items. The drawings shall provide tank dimensions and show anode arrangement for both elevated and sectional views of the tank, anode size and number, anode material, anode-suspension and flotation details, conduit size, wire size, rectifier size and location, wiring diagram, and any other pertinent information considered necessary.

3.2 SUBMITTALS. In accordance with SECTION: SPECIAL CLAUSES, the Contractor shall submit for approval, data as specified herein on the following:

3.2.1 Category I.

Power Unit (Rectifier, Transformer, Automatic Voltage Controller)
Wiring Diagram
Rope
Anodes (Platinized niobium, Riser anodes, and XL anode by Pennwalt Corp.)
Floats
Maintenance and Operations Instruction
Welding Method
Detail Drawings (as specified in Par. 3.1)

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Surge (Lightning) Arresters
Calculations Showing Rectifier and Anode Sizing
Switches
Certification of the Supervisor's Qualifications

3.2.2 Category II. None.

3.3 OPERATING AND MAINTENANCE INSTRUCTIONS.

3.3.1 Operating instructions outlining the step-by-step procedures required for system start-up and operation shall be furnished. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features.

3.3.2 Maintenance instructions listing routine maintenance procedures, possible breakdowns, and repairs shall be furnished. The instructions shall include diagrams for the system as installed, instructions in making tank-to-reference electrode measurements, and frequency of monitoring.

3.4 SPARE PARTS DATA. After approval of the shop drawings and not later than 3 months prior to the date of beneficial occupancy, the Contractor shall furnish spare parts data for each different item of materials and equipment specified. The data shall include a complete list of parts, special tools, and supplies, with current unit prices and source of supply.

3.5 TRAINING COURSE. The Contractor shall conduct a training course for operating staff as designated by the Contracting Officer. The training period shall consist of a total of 8 hours of normal working time and shall start after the system is functionally complete, but prior to final acceptance tests.

3.6 PERFORMANCE TEST REPORTS. Upon completion and testing of the installed system, test reports shall be submitted in booklet form tabulating all field tests and measurements. Each test report shall indicate the final position of controls.

4. IMPRESSED CURRENT ANODES.

4.1 ANODE ELEMENT. Platinized niobium floating anode wire extended life similar to PERMANODE by Harco Corporation and shall be designed to provide a life of not less than 10 years. The anode wire shall be platinized niobium and of required length to provide a current distribution of approximately 3.5 milliamperes per square foot on the appropriate surfaces.

4.2 ANODE OPTION. In lieu of the platinized niobium floating anode system, a patented XL anode assembly and XL reference electrode assembly by Pennwalt Corporation may be submitted.

4.3 RISER ANODES shall be installed so they cannot be pulled loose from icing.

4.4 HIGH SILICON CAST IRON ANODES. Cast iron anodes shall be of the size indicated and shall conform to the following requirements:

4.4.1 Chemical Composition (Nominal).

Percent by Weight

Element	Grade 1	Grade 2
Silicon	14.20-14.75	14.20-14.75
Manganese	1.50 Max	1.50 Max.
Carbon	0.70-1.10	0.75-1.15
Chromium	----------	3.25-5.00
Iron	Balance	Balance

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4.4.2 Electrical Resistivity. 72 microhm-centimeter at 20° F. (Maximum).

4.4.3 Physical Properties (Nominal).

Tensile strength	15,000 psi
Compressive strength	100,000 psi
Brinel hardness	520
Density	7.0 grams per cubic centimeter
Melting point	2,300 degrees F.
Coefficient of expansion from 32 to 212 degrees F.	0.00000733 centimeter per degree F.

4.5 ANODE CONNECTING CABLES. Anodes shall have connecting cables installed at the factory. The Contractor shall submit a certified test report showing that the connecting method has passed a 120-day laboratory test without failure at the place of connection wherein the anode was subjected to maximum recommended current output while immersed in a 3 percent sodium chloride solution.

5. RECTIFIERS AND ASSOCIATED EQUIPMENT.

5.1 RECTIFIER UNIT. Rectifier unit shall meet the requirements of NEMA MR 20 and shall consist of a transformer, rectifying elements, transformer tap adjuster, terminal block, one combination volt-ammeter, one toggle switch for each meter, fuse holders with fuses for each d.c. circuit, variable resistors, an a.c. power-supply circuit breaker, lightning arresters for both input and output; all wired and assembled in a weatherproof metal cabinet. The overall efficiency of the rectifier shall be not less than 65 percent when operated at nameplate rating and shall be capable of supplying continuous full rated output at an ambient temperature of 112° F. in full sunlight with expected life in excess of 10 years.

5.1.1 Transformer shall conform to UL 506 and NEMA ST 1, or NEMA TR-1, as applicable.

5.1.2 Rectifying elements shall conform to NEMA PV 3, and shall be silicon diodes or selenium cells connected in such manner as to provide full-wave rectification. Silicon diodes shall be protected by selenium surge cells or varistors against over-voltage surges and by current limiting devices against over-current surges.

5.1.3 Meters shall be accurate to within plus or minus 2 percent of full scale at 80° F., and shall possess temperature stability above and below 80° F. of at least 1 percent per 10° F. Separate meters shall be 2-1/2-inch nominal size or larger.

5.1.4 A single-pole, flush-mounted, fully magnetic, properly rated nonterminal type circuit breaker shall be installed in the primary circuit of the rectifier supply transformer.

5.1.5 Cartridge-type fuses conforming to NEMA FU 1 with suitable fuse holders shall be provided in each leg of the d.c. circuit.

5.2 CABINET. Cabinet shall be constructed of not lighter than No. 16-gage steel, and shall be provided with a full door. The door shall be hinged and have a hasp that will permit the use of a padlock. The cabinet shall be fitted with screened openings of the proper size to provide for adequate cooling. Holes, conduit knockouts, or threaded hubs of sufficient size and number shall be conveniently located.

5.2.1 A complete wiring diagram of the power unit showing both the a.c. supply and the d.c. connections to anodes shall be on the inside of the cabinet door. All components shall be shown and labeled.

5.2.2 Grounding provisions shall comply with NFPA No. 70 and UL 467 including a ground terminal in the cabinet. The grounding conductor from the terminal to the earth grounding system shall be solid or stranded copper not smaller than No. 6 AWG. The earth grounding system shall consist of one or more 5/8-inch diameter copper-clad steel rods. Ground rods shall be 8 feet long, minimum.

5.2.3 The cabinet and supporting mounting shall be painted with the manufacturer's standard paint system.

5.3 WIRING. Wiring shall be installed in accordance with NFPA No. 70 utilizing type TW or RHW or polyethylene insulation. Fittings for conduit and cable work shall conform to UL 514. Outlets shall be of the threaded hub type with gasketed covers. Conduit shall be securely fastened at 8-foot intervals or less. Splices shall be made in outlet fittings only. Conductors shall be color coded for identification.

5.4 OIL IMMERSED ENCLOSURES. Enclosures shall be of 11-gage steel or heavier, with an accessible drain plug. The oil level shall be clearly marked. The lid shall be hinged and have quick release clamps to secure it in closed position. A stop shall limit the swing of the lid when opened. A compressible, oil resistant, positive sealing gasket shall be provided. The gasket shall return to its original shape upon release of lid pressure. The gasket shall be attached to the tank or lid and joints shall be free of gaps. Base mounting using 4-inch high channels shall be provided.

6. MISCELLANEOUS MATERIALS.

6.1 REFERENCE ELECTRODES. The electrodes shall be copper-copper sulphate type provided with micropore diffusion window for water contact and watertight plug for renewal of copper sulphate crystals and solution.

6.2 AUTOMATIC CATHODIC PROTECTION CONTROL. The system shall be capable of maintaining a tank-to-water potential criterion of protection within plus or minus 0.025 volt regardless of changes in water chemistry, temperature, or water level in the tank. Provision shall be made for readily changing the range and limits of the criterion.

6.3 TANK-TO-WATER POTENTIAL METER. The controller shall be equipped with a calibrated voltmeter having an internal impedance exceeding 1,000 megohms which shall be so connected to read, from the system reference cell, the tank-to-water potential being maintained by the cathodic protection system. The voltage reading shall be free of "IR" drop error.

6.4 CALIBRATED SHUNTS. Shunts shall conform to Mil. Spec. MIL-I-1361.

6.5 ELECTRICAL WIRE AND ASSOCIATED MATERIALS.

6.5.1 Anode connecting wire shall be No. 8 AWG stranded copper wire with type CP high molecular weight polyethylene insulation, 7/64-inch thick, 600-volt rating, in accordance with NEMA WC 5. Cable-to-anode contact resistance shall be 0.003 ohms maximum.

6.5.2 Cable for anode header and distribution shall be 8 AWG stranded copper wire with type CP high molecular weight polyethylene, 7/64-inch thick insulation, 600-volt rating, in accordance with NEMA WC 5.

6.5.3 Reference electrode wire shall be stranded copper wire with NFPA No. 70 type RHW-USE or polyethylene insulation.

6.6 CONDUIT. Rigid galvanized steel conduit and accessories shall conform to UL 6. Nonmetallic conduit shall conform to NEMA TC 2.

6.7 TEST BOXES AND JUNCTION BOXES. Boxes shall be outdoor type conforming to UL 514.

6.8 POLYETHYLENE INSULATION. Polyethylene insulation shall comply with the requirements of ASTM D 1248 and of the following types, classes, and grades:

6.8.1 High molecular weight polyethylene shall be Type I, Class C, Grade E5.

6.8.2 High density polyethylene shall be Type III, Class C, Grade E3.

6.9 PRESSURE-SENSITIVE VINYL PLASTIC ELECTRICAL TAPE. Tape shall conform to UL 510.

7. ANODES.

7.1 ANODE INSTALLATION.

7.1.1 Anodes of the platinized niobium wire type shall be installed on flotation units of the required number and spacing for proper flotation.

7.1.2 Anodes for the XL System shall be suspended from roof plate or structurals by means of factory installed connecting wire designed to support the anodes in air before submergence without failure of the electrical wire insulation or the electrical conductor.

7.1.3 Anodes shall be suspended in a way that will prevent contact with tank surfaces and shall be hung clear of man-access roof hatches and such items as ladders, heater pipes, and stay rods.

7.1.4 Anode hangers shall electrically insulate the anode suspending wire from the tank steel.

7.1.5 A handhole having a minimum diameter of 6 inches shall be provided in the tank roof for each anode string to permit replacement or inspection of anodes on the XL System.

7.2 ANODE CONNECTIONS.

7.2.1 Anodes shall be electrically connected to the positive d.c. header cable with compression connectors or split bolts, or the header cable may terminate in a junction box for connection with all anode cables. A minimum of two split bolts shall be used for each connection if split bolts are used.

7.2.2 Header cable for the XL System shall be installed on the underside of the roof with electrically insulating hangers and shall enter the tank near the roofline from an externally mounted junction box. External wiring shall be in conduit.

7.2.3 All under-roof electric wire splices shall be made above the high waterline and sealed watertight using a minimum of 2-1/2 lap layers of butyl rubber tape followed by 2-1/2 lap layers of plastic tape.

8. RECTIFIERS.

8.1 RECTIFIER AND CONTROL INSTALLATION. Mounting shall be as shown.

8.2 GROUNDING. The grounding system for grounding rectifier cabinets shall have a resistance to earth of not more than 25 ohms as determined by an approved method.

9. PERMANENT REFERENCE ELECTRODES.

9.1 CALIBRATION. Permanent reference electrodes shall be calibrated against a standard electrode before installation. Calibration shall be done in a test tank containing water with the same composition as the tank to be protected. The permanent electrodes shall measure reference voltage agreeing with that measured by the standard electrode within, plus or minus 0.005 volt, when the sensing windows of the two electrodes being compared are not more than 1/6-inch apart, but not touching.

9.2 INSTALLATION.

9.2.1 Installation of permanent reference electrodes shall be made at points in the tank which will monitor minimum and maximum tank-to-water potentials [and as otherwise needed for automatic control system].

9.2.2 Sensing windows of reference electrodes shall be located between 1/4-inch and 1/2-inch away from the steel surface sensed and shall be fixed in position preventing contact with tank steel.

10. CRITERIA OF PROTECTION.

10.1 MINIMUM.

10.1.1 The criterion of protection shall be a negative voltage of at least minus 0.85 volt as measured between the tank and a saturated copper-copper-sulphate reference electrode. Determination of this voltage shall be made with the cathodic protection system in operation.

10.2 MAXIMUM.

10.2.1 In order to mitigate disbonding of the interior coating in the tank, potential between a copper-copper-sulfate reference electrode and the tank at any point shall not be more negative than minus 1.1 volt measured with the electrode located between 1/4-inch and 1/2-inch away from the steel surface, but not touching it.

11. TESTING, ADJUSTING, AND PLACING IN SERVICE.

11.1 TESTING. Upon completion of the installation, the tank shall be filled to maximum working level. The rectifier shall be energized and adjusted to provide current to the anodes at the level that will protect the tank. The measurements detailed below shall be made with voltmeters having a sensitivity not less than 100,000 ohms per volt.

11.1.1 The following series of tank-to-water potential measurements with a portable reference electrode placed not more than 1/2-inch away from but not touching the tank wall shall be performed:

a. On a vertical line midway between two anode strings beginning at a point 1 foot below water level and continuing at points 3 feet apart until the bottom of the tank is reached.

b. On a second vertical line midway between two anode strings on the opposite side of the tank from the first vertical line beginning at a point 1 foot below water level and continuing at points 3 feet apart until the bottom of the tank is reached.

c. Across the bottom of the tank in a line between the two vertical lines at 3-foot intervals.

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d. In at least four places which are closest to anodes.

11.1.2 The portable reference electrode used for the test shall be calibrated against the standard electrode specified in Paragraph: PERMANENT REFERENCE ELECTRODES.

11.1.3 All test measurements and their locations, as well as measurements made with the permanent electrodes simultaneously with the test measurements, shall be recorded.

11.2 ADJUSTING. Final adjustment of the rectifier output current shall be made so that repeated voltage readings taken, as specified for testing, meet the criteria in Paragraph: CRITERIA OF PROTECTION.

11.3 PLACING IN SERVICE. After final adjustment, the cathodic protection system shall be placed in service and the condition of the system as left by the Contractor shall be recorded and shall indicate [transformer tap settings;] voltage readings from reference electrode to tank, readings both horizontal and vertical; automatic control differential setting; a.c. supply voltage; adjusted d.c. output voltage; and total protective current.

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